

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA1 | Euston - Station and Approach  
**Data appendix (AQ-001-001)**  
Air quality

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The air quality appendix for the Euston - Station and Approach community forum area (CFA1) comprises:

- discussion of the policy framework (Section 2);
- baseline air quality data (Section 3);
- dust impact evaluation and risk rating (Section 4);
- air quality assessment - road traffic (Section 5); and
- air quality assessment - combustion plant (Section 6).

1.1.2 Maps referred to throughout the air quality appendix are contained in the Volume 5, Air Quality Map Book.

## 2 Policy framework

- 2.1.1 The London Plan<sup>1</sup> forms the Regional Spatial Strategy for Greater London and integrates economic, environmental, transport and social frameworks. Specifically for air quality, it seeks to achieve reductions in pollutant emissions and minimise public exposure to pollution. Policy 7.14 of the London Plan sets out a number of objectives such as minimising increased exposure to existing poor air quality, the need to reduce emissions from demolition and construction activities using best practice and the provision of on-site mitigation measures during development.
- 2.1.2 The Mayor's Air Quality Strategy<sup>2</sup> and Supplementary Planning Guidance (SPG) on Sustainable Design and Construction<sup>3</sup> set out actions for improving London's air quality and include measures aimed at reducing emissions from transport and new developments. A key objective of the strategy is to make better use of the planning process so that new developments do not contribute to air pollution. Policy 3 also gives support to the expansion of competitive rail-based alternatives to aviation, including the development of a national high speed rail network.
- 2.1.3 At the local level, the two local authorities in the Euston area have policies that seek to limit pollution levels, improve air quality and reduce emissions from development:
- the London Borough of Camden (LBC) Core Strategy<sup>4</sup> Policy CS16 seeks to improve health and well-being, recognising the impact of poor air quality on health;
  - the City of Westminster (CoW) Core Strategy<sup>5</sup> Policy CS30 seeks to reduce air pollution and minimise emissions of air pollution, whilst Westminster Unitary Development Plan (UDP)<sup>6</sup> Saved Policy STRA34 seeks to improve air quality through its air quality management plan and Saved Policy ENV5 encourages development that does not increase local air pollution.
- 2.1.4 In addition, local and regional guidance relevant to this assessment includes the Camden Air Quality Action Plan<sup>7</sup> (AQAP) and Westminster AQAP<sup>8</sup>.
- 2.1.5 Local and regional guidance relevant to the consideration of climate change adaptation and air quality is provided in the draft Climate Change Adaption Strategy for London<sup>9</sup>.

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<sup>1</sup> Greater London Authority (GLA), (2011), *The London Plan: Spatial Development Strategy for Greater London*, GLA, London.

<sup>2</sup> Greater London Authority (GLA), (2010), *Clearing the Air: The Mayor's Air Quality Strategy*, GLA, London.

<sup>3</sup> Greater London Authority (GLA), (2006), *Sustainable Design and Construction: The London Plan Supplementary Planning Guidance*, GLA, London.

<sup>4</sup> London Borough of Camden, (2010), *Core Strategy Policy*.

<sup>5</sup> City of Westminster, (2011), *Core Strategy Policy*.

<sup>6</sup> City of Westminster, (2010), *Unitary Development Plan*.

<sup>7</sup> London Borough of Camden, (2013), *Air Quality Action Plan 2013-2015* (draft for consultation).

<sup>8</sup> City of Westminster, (2013), *Air Quality Action Plan 2013-2018*.

<sup>9</sup> GLA, (2010), *Draft Climate Change Adaptation Strategy for London*, GLA, London.

## 3 Baseline air quality data

### 3.1 Existing air quality

#### Local authority review and assessment information

3.1.1 LBC and CoW both have designated air quality management areas (AQMAs) covering their entire administrative areas. The entirety of the Euston area is within designated AQMAs.

3.1.2 LBC and CoW both have AQAPs in place aimed at improving air quality.

#### Local air quality monitoring data

3.1.3 Monitoring sites within the study area that are considered relevant for this assessment are shown in Map AQ-01-001 (Volume 5, Air Quality Map Book). Table 1 to Table 3 provide a summary of the recorded pollutant concentrations at these sites.

3.1.4 The pollutant concentrations can be compared to the air quality standards:

- $40\mu\text{g}/\text{m}^3$  as an annual mean for  $\text{NO}_2$  and  $\text{PM}_{10}$ ;
- $200\mu\text{g}/\text{m}^3$  one-hour mean for  $\text{NO}_2$  not to be exceeded more than 18 times a year (equivalent to the 99.8<sup>th</sup> percentile of the one-hour mean);
- $50\mu\text{g}/\text{m}^3$  24-hour mean for  $\text{PM}_{10}$  not to be exceeded more than 35 times a year (equivalent to the 90.4<sup>th</sup> percentile of the 24-hour mean); and
- $25\mu\text{g}/\text{m}^3$  as an annual mean for  $\text{PM}_{2.5}$ .

#### Continuous monitoring

3.1.5 This section summarises the results from the continuous monitoring sites that are considered relevant for the assessment of air quality in this study area.

Table 1: Annual mean pollutant concentrations recorded at continuous monitoring sites<sup>10</sup>

| Pollutant  | Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ ) |         |                       |      |      |
|--|---|---------|-----------------------|------|------|
|  | 2008  | 2009    | 2010                  | 2011 | 2012 |
| <b>LBC - Bloomsbury (530123, 182014)</b>         |   |         |                       |      |      |
| $\text{NO}_2$                                    | 55  | 54      | 55                    | 50   | 55   |
| $\text{PM}_{10}$                                 | 23  | 23      | 18                    | 23   | 19   |
| $\text{PM}_{2.5}$                                | 17  | 16      | 16                    | 17   | 16   |
| <b>LBC - Shaftesbury Avenue (530057, 181285)</b> |   |         |                       |      |      |
| $\text{NO}_2$                                    | 80  | 88      | 89                    | 76   | 71   |
| $\text{PM}_{10}$                                 | 30  | 30      | 30                    | 31   | 29   |
| <b>LBC - Euston Road (529884, 182639)</b>        |   |         |                       |      |      |
| $\text{NO}_2$                                    | No data   | No data | No data <sup>11</sup> | 123  | 106  |

<sup>10</sup> Kings College London; <http://www.londonair.org.uk>; Accessed: May 2013.

<sup>11</sup> Site opened 2010.



| Pollutant  | Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ ) |      |      |         |                       |
|--|---|------|------|---------|-----------------------|
|  | 2008  | 2009 | 2010 | 2011    | 2012                  |
| <b>CoW - Marylebone Road (528121, 182015)</b>                                    |   |      |      |         |                       |
| NO <sub>2</sub>  | 115   | 107  | 98   | 97      | 94                    |
| PM <sub>10</sub>   | 40  | 36   | 35   | 41      | 37                    |
| PM <sub>2.5</sub>  | 20  | 17   | 17   | No data | No data <sup>12</sup> |
| <b>CoW - Marylebone Road Filter Dynamics Measurement System (528121, 182015)</b> |   |      |      |         |                       |
| PM <sub>10</sub>   | 35  | 37   | 32   | 38      | 31                    |
| PM <sub>2.5</sub>  | No data <sup>13</sup>                                   | 22   | 23   | 24      | 21                    |
| <b>CoW - Horseferry Road (529778, 178960)</b>                                    |   |      |      |         |                       |
| NO <sub>2</sub>  | 40  | 44   | 49   | 41      | 39                    |
| PM <sub>10</sub>   | No data <sup>14</sup>                                   | 15   | 21   | 19      | 18                    |
| <b>CoW - Charing Cross Library (529997, 180699)<sup>15</sup></b>                 |   |      |      |         |                       |
| NO <sub>2</sub>  | 78  | 84   | 89   | No data | No data               |
| <b>CoW - Covent Garden (530444, 180903)<sup>16</sup></b>                         |   |      |      |         |                       |
| NO <sub>2</sub>  | No data   | 49   | 52   | No data | No data               |

Table 2: Number of hours when hourly mean NO<sub>2</sub> concentrations exceed  $200\mu\text{g}/\text{m}^3$  at continuous monitoring sites<sup>17,18</sup>

| Site   | Number of exceedances of hourly mean NO <sub>2</sub> standard |           |                       |           |                       |
|--|---|-----------|-----------------------|-----------|-----------------------|
|  | 2008  | 2009      | 2010                  | 2011      | 2012                  |
| LBC - Bloomsbury (530123, 182014)                  | 0 (138)   | 2 (122)   | 1 (125)               | 0 (134)   | 1 (133)               |
| LBC - Shaftesbury Avenue (530057, 181285)          | 8 (190)   | 10 (191)  | 21 (207)              | 15 (198)  | 12 (191)              |
| LBC - Euston Road (529884, 182639)                 | No data   | No data   | No data <sup>11</sup> | 703 (309) | 293 (260)             |
| CoW - Marylebone Road (528121, 182015)             | 801 (316)   | 469 (262) | 524 (279)             | 217 (244) | 122 (235)             |
| CoW - Horseferry Road (529778, 178960)             | 1 (111)   | 0 (129)   | 3 (160)               | 0 (144)   | 0 (120)               |
| CoW - Charing Cross Library (529997, 180699)       | 24 (205)  | 23 (211)  | 33 (210)              | 0 (170)   | No data <sup>15</sup> |
| CoW - Covent Garden (530444, 180903) <sup>16</sup> | No data   | 0 (126)   | 0 (143)               | 0 (121)   | No data               |

<sup>12</sup> PM<sub>2.5</sub> not monitored in 2011 and 2012.<sup>13</sup> PM<sub>2.5</sub> monitoring began in 2009.<sup>14</sup> PM<sub>10</sub> monitoring began in 2009.<sup>15</sup> Site closed in 2011. 3% data capture in 2011.<sup>16</sup> Site open 2009 - 2011. 3% data capture in 2011.<sup>17</sup> 99.8<sup>th</sup> percentile of hourly mean NO<sub>2</sub> concentrations in brackets ( $\mu\text{g}/\text{m}^3$ ).<sup>18</sup> Kings College London; <http://www.londonair.org.uk>; Accessed: May 2013.

Table 3: Number of days when daily mean PM<sub>10</sub> concentrations exceed 50µg/m<sup>3</sup> at continuous monitoring sites<sup>19,20</sup>

| Site  | Number of exceedances of daily mean PM <sub>10</sub> standard |         |         |         |         |
|---|---|---------|---------|---------|---------|
|   | 2008  | 2009    | 2010    | 2011    | 2012    |
| LBC - Bloomsbury (530123, 182014)   | 13 (41)   | 13 (42) | 2 (28)  | 17 (38) | 10 (32) |
| LBC - Shaftesbury Avenue (530057, 181285)                                 | 20 (44)   | 13 (43) | 4 (42)  | 27 (47) | 17 (45) |
| CoW - Marylebone Road (528121, 182015)                                    | 67 (56)   | 36 (51) | 45 (52) | 73 (58) | 44 (53) |
| CoW - Marylebone Road Filter Dynamics Measurement System (528121, 182015) | 42 (52)   | 44 (57) | 25 (47) | 57 (57) | 23 (46) |
| CoW - Horseferry Road (529778, 178960)                                    | No data <sup>14</sup>   | 0 (20)  | 1 (33)  | 8 (34)  | 10 (33) |

### Diffusion tubes

3.1.6 This section summarises the results from the diffusion tube sites that are considered relevant for the assessment of air quality in this study area.

Table 4: Annual mean NO<sub>2</sub> concentrations recorded at diffusion tube monitoring sites<sup>21,22,23</sup>

| Site                                   | Ordnance Survey coordinates | Annual mean NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |      |      |                    |                    |
|--|-----------------------------|---|------|------|--------------------|--------------------|
|  |                             | 2008  | 2009 | 2010 | 2011 <sup>24</sup> | 2012 <sup>24</sup> |
| Wakefields Gardens                     | 530430, 182430              | 38  | 39   | 34   | 46                 | 39                 |
| 63 Gower Street                        | 529671, 181970              | 73  | 83   | 74   | No data            | No data            |
| Tavistock Gardens                      | 529880, 182334              | 47  | 50   | 52   | 48                 | 40                 |
| Tottenham Court Road                   | 529568, 181728              | 84  | 108  | 92   | 92                 | 83                 |
| British Library                        | 529977, 182809              | 49  | 54   | 47   | No data            | No data            |
| Russell Square Gardens                 | 530120, 182034              | 44  | 45   | 44   | No data            | No data            |
| Brill Place                            | 529914, 183147              | 49  | 52   | 54   | 51                 | 50                 |
| Bloomsbury Street                      | 529962, 181620              | 77  | 81   | 41   | 77                 | 72                 |
| Goodge Street                          | 529488, 181719              | 57  | 61   | 50   | No data            | No data            |
| Argyle School                          | 530210, 182762              | 52  | 50   | 50   | No data            | No data            |
| Robert Street                          | 529133, 182695              | 48  | 49   | 45   | No data            | No data            |
| Euston Road                            | 530110, 182795              | 93  | 87   | 82   | 93                 | 82                 |
| Drummond Street/Cobourg Street         | 529395, 182567              | 46  | 51   | 48   | No data            | No data            |
| London Westminster Automatic Urban and | 529780, 178958              | 46  | 40   | 46   | No data            | No data            |

<sup>19</sup> 90.4<sup>th</sup> percentile of daily mean PM<sub>10</sub> concentrations in brackets (µg/m<sup>3</sup>).

<sup>20</sup> Kings College London; <http://www.londonair.org.uk>; Accessed: May 2013.

<sup>21</sup> London Borough of Camden (2012) Air Quality Updating and Screening Assessment.

<sup>22</sup> City of Westminster, (2011), Air Quality Progress Report.

<sup>23</sup> City of Westminster, (2010), Air Quality Progress Report.

<sup>24</sup> 'No data' indicates data not available in local authority reports.

| Site                 | Ordnance Survey coordinates | Annual mean NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |      |      |                    |                    |
|----------------------|-----------------------------|---|------|------|--------------------|--------------------|
|                      |                             | 2008  | 2009 | 2010 | 2011 <sup>24</sup> | 2012 <sup>24</sup> |
| Rural Network (AURN) |                             |   |      |      |                    |                    |
| Covent Garden        | 530434, 180909              | 51  | 48   | 49   | No data            | No data            |
| Air Street           | 529453, 180616              | 75  | 81   | 92   | No data            | No data            |
| Oxford Street        | 528274, 181065              | 137   | 139  | 122  | No data            | No data            |

## Greater London Authority maps

- 3.1.7 Greater London Authority (GLA) maps<sup>25</sup> of modelled pollution concentrations provide further context on the spatial pattern of air pollution across London and indications of likely pollutant concentrations across the capital. However, modelling is less robust than monitoring data and may not fully take into account local characteristics that influence pollution levels.
- 3.1.8 GLA pollution maps estimate that annual NO<sub>2</sub> concentrations exceed air quality objectives at or near main roads within the study area. The maps show no significant change in NO<sub>2</sub> concentrations from 2008 to 2011.
- 3.1.9 Annual mean PM<sub>10</sub> concentrations have reduced marginally at all locations between 2008 and 2011 according to the GLA modelling estimates, although not along main roads such as Marylebone Road and Euston Road, which in 2011 were still exceeding the air quality standard of 40µg/m<sup>3</sup>. The number of days on which the PM<sub>10</sub> concentrations exceed the standard of 50µg/m<sup>3</sup> is estimated to have fallen between 2008 and 2011, although the frequency of exceedances is higher near busy roads.
- 3.1.10 PM<sub>2.5</sub> exceedances across the boroughs are estimated to have decreased between 2008 and 2011 and are confined to locations along busy roads – sites that are not likely to be representative of relevant exposure locations.

## Background pollutant concentrations

- 3.1.11 Estimates of background air quality were obtained from the Department for Environment, Food and Rural Affairs (Defra) maps<sup>26</sup>. Background NO<sub>2</sub> concentrations are close to or exceeding air quality standards throughout the study area. Background PM<sub>10</sub> concentrations are within air quality standards throughout the study area. NO<sub>2</sub> annual mean concentrations were in the range 29.8µg/m<sup>3</sup> - 59.0µg/m<sup>3</sup> in 2012. PM<sub>10</sub> annual mean concentrations were in the range 18.6µg/m<sup>3</sup> - 24.3µg/m<sup>3</sup> in 2012.
- 3.1.12 Defra background concentrations for the relevant assessment years were used in the Design Manual for Roads and Bridges (DMRB)<sup>27</sup> and ADMS-Roads assessments.

<sup>25</sup> Greater London Authority (GLA), (2010), *London Atmospheric Emissions Inventory 2008 Concentration Maps*; <http://data.london.gov.uk/laei-2008-concentration-maps>; Accessed: May 2013.

<sup>26</sup> Department for Environment, Food and Rural Affairs (Defra), (2012), *Defra background maps 2010*; <http://laqm.defra.gov.uk/maps/maps2010.html>; Accessed: July 2013.

<sup>27</sup> Highways Agency, (2007), *The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07)*.

## Local emission sources

- 3.1.13 The main source of pollution within the study area is road vehicles. Major roads include Euston Road, Hampstead Road, Eversholt Street, Pancras Road and Portland Place. Other emission sources in Camden include a permitted Part A<sup>28, 29</sup> process at Charterhouse Street<sup>30</sup>. Due to the distance of Part A processes from the Proposed Scheme and the nature of their emissions, it is unlikely that these will have an effect on local air quality in the study area. Contributions to local pollutant concentrations made by these industrial installations are included within background concentrations used in this assessment.

## 3.2 Receptors

### Human

#### *Construction phase*

- 3.2.1 There are many potential receptors in the Euston area, given its urban nature and the proximity of many residential properties, commercial premises and community facilities to construction sites and roads where traffic flows will change. Receptors at greatest risk of dust effects are indicated in Map AQ-02-001-01 (Volume 5, Air Quality Map Book).

#### *Operational phase*

- 3.2.2 There are many receptors in the Euston area and high densities of residential properties. Several sensitive receptors identified along the route include St Aloysius Infant School, St Mary & St Pancras Church of England Primary School, Christ Church of England Primary School (Regent's Park), North Bridge House Preparatory School and The Cavendish School.

### Ecological

#### *Construction phase*

- 3.2.3 There are no ecological receptors with statutory designations within the Euston area.

#### *Operational phase*

- 3.2.4 There are no ecological receptors with statutory designations within the Euston area.

<sup>28</sup> *Pollution Prevention and Control Act 1999* (c.24), London, Her Majesty's Stationery Office.

<sup>29</sup> *The Environmental Permitting (England and Wales) Regulations 2010* (SI 210 No. 675), London, Her Majesty's Stationery Office.

<sup>30</sup> Environment Agency, *What's in your Backyard?*; <http://www.environment-agency.gov.uk/wiyby>; Accessed: August 2013.

## 4 Dust impact evaluation and risk rating

4.1.1 The following sections provide details of the assessment of construction impacts following the Technical Note- Air Quality Assessment for Construction Issues and Institute of Air Quality Management (IAQM) guidance<sup>31</sup>. Where considered useful to identify receptors and their relationship to the construction activity, a specific figure is provided and referenced.

Table 5: Evaluation and risk rating of construction activities

| Activity   | Distance to nearest receptor | Dust emission class | Dust risk category | Sensitivity of surrounding area | Magnitude of impact (with draft Code of Construction Practice <sup>32</sup> mitigation measures) | Principal justifications  |
|--|------------------------------|---------------------|--------------------|---------------------------------|--|---|
| <b>Euston - Station and Approach (Map AQ-02-001-01 (Volume 5, Air Quality Map Book) Figures 1.1 - 1.4)</b> |                              |                     |                    |                                 |  |   |
| Demolition   | Less than 20m                | Large               | High               | Very high                       | Slight adverse   | <p>1. 306,925 tonnes of waste will be generated during demolition</p> <p>Potentially dusty materials on site (e.g. concrete)</p> <p>2. Densely populated area with more than 100 dwellings within 20m of site</p>   |
| Earthworks   | Less than 20m                | Large               | High               | Very high                       | Slight adverse   | <p>1. Area more than 10,000m<sup>2</sup> involved in earthworks</p> <p>647,000m<sup>3</sup> of material will be excavated from the station and station approach</p> <p>8,000m<sup>3</sup> of potentially contaminated ground will be removed from the spent track</p> |

<sup>31</sup> Institute of Air Quality Management (IAQM), (2011), *Guidance on the assessment of the impacts of construction on air quality and the determination of their significance*.

<sup>32</sup> Volume 5: Appendix CT-003-000.

| Activity     | Distance to nearest receptor | Dust emission class | Dust risk category | Sensitivity of surrounding area | Magnitude of impact (with draft Code of Construction Practice <sup>32</sup> mitigation measures) | Principal justifications   |
|--------------|------------------------------|---------------------|--------------------|---------------------------------|--|--|
|              |                              |                     |                    |                                 |  | ballast<br><br>2. Densely populated area with more than 100 dwellings within 20m of site   |
| Construction | Less than 20m                | Medium              | High               | Very high                       | Slight adverse   | 1. Potentially dusty materials used during construction (e.g. concrete)<br><br>2. Densely populated area with more than 100 dwellings within 20m of site   |
| Track-out    | Less than 20m                | Large               | High               | Very high                       | Slight adverse   | 1. Assumption of more than 100 heavy goods vehicle (HGV) trips per day<br><br>Significant quantities of demolition and earth materials will be transported over the period<br><br>Haulage routes include narrow roads with high densities of residential properties<br><br>2. Densely populated area with more than 100 dwellings within 20m of site |

Table 6: Summary of construction dust impacts and effects

| Location                      | Magnitude of impact | Effect of dust-generating activities | Additional mitigation |
|-------------------------------|---------------------|--------------------------------------|-----------------------|
| Euston - Station and Approach | Slight adverse      | Not significant                      | None required         |

## 5 Air quality assessment - road traffic

### 5.1 Overall assessment approach

- 5.1.1 The air quality assessment for road related emissions has considered the use of three different approaches based on the scale of changes in traffic and road alignment. Where the DMRB thresholds detailed in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) will not be exceeded, an additional assessment is not required as the air quality impacts will be minimal. If these thresholds are breached, then a quantitative assessment has been carried out.
- 5.1.2 Where the road configuration is straightforward, the DMRB screening method has been used to predict changes in air quality. Where the road layout is considered to be complex or where the use of the DMRB screening method has indicated that there will be a potential exceedance of air quality standards, the atmospheric dispersion model ADMS-Roads has been used for the assessment. Professional judgment has been used to select the appropriate tool for each area.
- 5.1.3 In this study area both the DMRB screening method and the ADMS-Roads model have been used for the assessment.

#### Assessing congestion

- 5.1.4 To assess the impact of congestion on the DMRB assessment, an additional DMRB assessment was carried out that modelled congested situations. This assumed a speed of 10kph in all scenarios for all links where the speed in the traffic model exceeded 10kph, in order to identify locations where queuing traffic might give rise to higher concentrations and require further assessment. The results of this additional assessment are presented alongside the main results.
- 5.1.5 For the ADMS-Roads modelling, queues were assumed to occur on roads with an average speed of less than 50% of the speed limit. Queue speeds of 5kph were assumed. A queue length of 25-50m was assumed, depending on the speed on the road<sup>33</sup>. In the absence of information on the occurrence of queuing, it was assumed that queuing occurred between 7am and 7pm.

### 5.2 Model inputs and verification

#### Model parameters for detailed assessment

- 5.2.1 ADMS-Roads was used for the detailed assessment. A surface roughness length of 1.5m, meteorological site surface roughness length of 0.2m, minimum Monin Obukhov length of 100m and latitude of 51.5 degrees were used in the detailed assessment. All other model parameters were model default settings. Meteorological data from the London Heathrow monitoring site was used.

<sup>33</sup> Queue length (in metres) was calculated using the following formula:  $l = 50 \cdot ((v/0.5v_l) \times 25)$ , where  $l$  = queue length,  $v$  = road speed,  $v_l$  = speed limit.



## Model verification

- 5.2.2 Since the model predicts nitrogen oxides (NO<sub>x</sub>) contributions for the modelled roads, this was initially compared to the NO<sub>x</sub> road contribution derived from NO<sub>x</sub> concentrations (where available) measured at monitoring sites and Defra background maps.
- 5.2.3 Roadside monitoring sites were chosen from across the traffic model area, which extends both west and north of the study area. This allowed a greater number of sites to be included in the verification. Sites where nearby busy roads were not included in the traffic model data set (and which, therefore, could not be modelled correctly as roadside sites with the traffic data set) were excluded from assessment. The results of this comparison are shown in Table 7.

Table 7: Comparison of monitored and modelled NO<sub>x</sub> concentrations for verification

| Site   | Monitored total NO <sub>2</sub> | Monitored total NO <sub>x</sub> | Background NO <sub>2</sub> | Background NO <sub>x</sub> | Monitored road NO <sub>x</sub> | Modelled road NO <sub>x</sub> | Monitored/ modelled road NO <sub>x</sub> |
|--|---------------------------------|---------------------------------|----------------------------|----------------------------|--------------------------------|-------------------------------|--|
| Camden Euston Road (AURN site)               | 106.1                           | 350.0                           | 51.0                       | 102.3                      | 247.6                          | 83.2                          | 3.0                                      |
| Camden Shaftesbury Avenue (AURN site)        | 71.2                            | 163.0                           | 56.4                       | 116.4                      | 46.6                           | 23.8                          | 2.0                                      |
| Westminster Marylebone Road (AURN site)      | 93.6                            | 312.8                           | 43.0                       | 82.1                       | 230.7                          | 80.5                          | 2.8                                      |
| Camden 19 Kentish Town Road (Diffusion Tube) | 59.0                            | -                               | 34.7                       | 61.7                       | 46.9                           | 20.5                          | 2.3                                      |
| Camden 26 Camden Road (Diffusion Tube)       | 67.0                            | -                               | 38.7                       | 71.5                       | 60.2                           | 43.1                          | 1.4                                      |

- 5.2.4 The calculated model adjustment factor for the road contribution of NO<sub>x</sub> was 2.3. This was applied to all NO<sub>x</sub> results from the ADMS-Roads modelling. This is line with Defra guidance<sup>34</sup> on model verification.
- 5.2.5 A final check was then made to compare the total NO<sub>2</sub> concentrations from the modelling to the monitored data. This is shown in Table 8.

<sup>34</sup> Department for Environment, Food and Rural Affairs, (2009), *Technical Guidance Note LAQM TG(09)*.

Table 8: Comparison of monitored and modelled annual average NO<sub>2</sub> concentrations

| Site  | Monitored concentration<br>(µg/m <sup>3</sup> ) | Modelled concentration<br>(µg/m <sup>3</sup> ) | Difference ((modelled -<br>monitored)/monitored) x<br>100 |
|---|---|--|---|
| Camden Euston Road<br>(AURN site)               | 106.1   | 111.7  | 5.4%  |
| Camden Shaftesbury Avenue<br>(AURN site)        | 71.2  | 81.1   | 13.8%   |
| Westminster Marylebone<br>Road (AURN site)      | 93.6  | 103.8  | 10.8%   |
| Camden 19 Kentish Town<br>Road (Diffusion Tube) | 59.0  | 59.0   | 0.1%  |
| Camden 26 Camden Road<br>(Diffusion Tube)       | 67.0  | 78.3   | 16.8%   |

5.2.6 As the majority of modelled NO<sub>2</sub> concentrations were within 25% of the monitored concentrations, no further adjustment was undertaken.

## 5.3 Construction traffic model

5.3.1 Construction traffic data used in this assessment are detailed in Volume 5: Appendix TR-001-000. Scenarios assessed correspond to three peak phases of construction:

- test 1, representing 2017;
- test 2, representing 2019; and
- test 3, representing 2021.

### Receptors assessed

5.3.2 For all road links where DMRB criteria for local air quality were met, a number of receptors representative of worst-case exposure locations were selected for assessment. These included locations representative of highest concentrations along the roads, including those closest to junctions or to the road itself.

5.3.3 All receptors where DMRB screening identified a likely moderate adverse or substantial adverse impact were modelled within ADMS-Roads. Additional receptors close to DMRB receptors were added in order to ensure that worst-case exposure locations were captured.

5.3.4 Receptors assessed using the DMRB screening methodology and detailed ADMS-Roads modelling are listed in Table 9 and shown in Map AQ-01-001 (Volume 5, Air Quality Map Book).

Table 9: Modelled receptors (construction phase)

| Receptor | Description/location  | Ordnance Survey coordinates | Scenarios assessed with the Proposed Scheme |                        |
|----------|---|-----------------------------|---|------------------------|
|          |   |                             | DMRB assessment                             | ADMS-Roads assessment  |
| 1-1      | 122, Euston Road  | 529894, 182688              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-2      | Property at the southern corner of the junction of Hampstead Road and Mornington Crescent | 529140, 183128              | Test 1, test 2, test 3                      | -                      |
| 1-3      | 44, Doric Way   | 529650, 182763              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-4      | Cruciform Building, University College London, Grafton Way                                | 529479, 182267              | Test 1, test 2,                             | -                      |
| 1-5      | 40, Hampstead Road  | 529231, 182477              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-6      | Property at the junction of Kingsway and High Holborn (Sainsbury's)                       | 530495, 181514              | Test 1, test 2, test 3                      | -                      |
| 1-7      | Property at the junction of Bernard Street and Hunter Street                              | 530342, 182204              | Test 2,                                     | -                      |
| 1-8      | Hunstanton House, Cosway Street   | 527353, 181814              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-9      | 37, Mornington Crescent   | 529094, 183356              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-10     | Winchelsea House, St. Johns Wood Road   | 526757, 182527              | Test 2, test 3                              | Test 2, test 3         |
| 1-11     | Grove House (junction of Park Road and Prince Albert Road, near roundabout)               | 527238, 182871              | Test 2, test 3                              | -                      |

| Receptor | Description/location  | Ordnance Survey coordinates | Scenarios assessed with the Proposed Scheme |                        |
|----------|---|-----------------------------|---|------------------------|
|          |   |                             | DMRB assessment                             | ADMS-Roads assessment  |
| 1-12     | Property at the junction of Southampton Row and Russell Square                            | 530251, 181928              | Test 1, test 2, test 3                      | -                      |
| 1-13     | Property on the northern corner of the junction of Prince Albert Road and Avenue Road     | 527470, 183410              | Test 1, test 2,                             | -                      |
| 1-14     | Property at the junction of Harrington Square and Hampstead Road                          | 529186, 183132              | Test 1, test 2, test 3                      | -                      |
| 1-15     | Beckfoot , Amptill Square   | 529408, 183018              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-16     | Property south of the Hampstead Road Bridge (near Harrington Street)                      | 529172, 183007              | Test 1, test 2, test 3                      | -                      |
| 1-17     | Property opposite the junction of Edward Mews and Redhill Street                          | 528768, 183025              | Test 1, test 2,                             | -                      |
| 1-18     | Clifton Court , Northwick Terrace   | 526585, 182239              | Test 1, test 2, test 3                      | Test 2, test 3         |
| 1-19     | Property at the northern corner of the junction of Lidlington Place and Eversholt Street  | 529297, 183216              | Test 1, test 2, test 3                      | -                      |
| 1-20     | Property at the northern corner of the junction of Marylebone Road and Gloucester Place   | 527761, 181934              | Test 1, test 2, test 3                      | -                      |
| 1-21     | 506, Edgware Road   | 526610, 182203              | Test 2, test 3                              | Test 2, test 3         |
| 1-22     | 1, Albany Street  | 528853, 182293              | Test 2, test 3                              | Test 1, test 2, test 3 |
| 1-23     | Property at the southern corner of the junction of King's Cross Road and Frederick Street | 530801, 182725              | Test 1, test 2, test 3                      | -                      |
| 1-24     | 183-193 , Euston Road   | 529512, 182424              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-25     | 306, Edgware Road   | 527048, 181728              | Test 2, test 3                              | Test 2, test 3         |
| 1-26     | Property opposite the junction of Albany Street and Gloucester Gate Mews                  | 528634, 183442              | Test 2, test 3                              | -                      |
| 1-27     | Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 529140, 183370              | Test 1, test 2, test 3                      | -                      |
| 1-28     | University College Hospital, Gower Street   | 529401, 182363              | Test 1, test 2,                             | -                      |
| 1-29     | 251B , Gray's Inn Road  | 530521, 182771              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-30     | 343, Gray's Inn Road  | 530351, 182957              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-31     | Property opposite the junction of Woburn Walk and Upper Woburn Place                      | 529824, 182483              | Test 1, test 2, test 3                      | -                      |
| 1-32     | Property at junction of Park Square West and Marylebone Road                              | 528563, 182171              | Test 1, test 2, test 3                      | -                      |
| 1-33     | 248, Marylebone Road  | 527468, 181849              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |

| Receptor | Description/location  | Ordnance<br>Survey<br>coordinates | Scenarios assessed with the Proposed Scheme |                          |
|----------|---|-----------------------------------|---|--------------------------|
|          |   |                                   | DMRB assessment                             | ADMS-Roads<br>assessment |
| 1-34     | Property at the southern corner of the junction of Pratt Street and St Pancras Way        | 529432, 183934                    | Test 2,                                     | -                        |
| 1-35     | Property at the northern corner of the junction of Euston Road and North Gower Street     | 529402, 182410                    | Test 1, test 2, test 3                      | -                        |
| 1-36     | Beacon House, property at the junction of Kingsway and Parker Street                      | 530532, 181434                    | Test 1, test 2, test 3                      | -                        |
| 1-37     | Portman Mansions, junction of Marylebone Road and Chiltern Street                         | 528008, 181966                    | Test 1, test 2, test 3                      | -                        |
| 1-38     | Property opposite the junction of Great Portland Street and Clipstone Street              | 528921, 181849                    | Test 1,                                     | -                        |
| 1-39     | Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 529159, 183385                    | Test 1, test 2, test 3                      | -                        |
| 1-40     | Property at the southern corner of the junction of Guilford Street and Russell Square     | 530198, 182024                    | Test 1, test 2, test 3                      | -                        |
| 1-41     | Property at the western corner of the junction of Gower Street and Torrington Place       | 529636, 182047                    | Test 1, test 2, test 3                      | -                        |
| 1-42     | Property at the junction of Park Square East and Marylebone Road                          | 528777, 182218                    | Test 1, test 2, test 3                      | -                        |
| 1-43     | Property at the northern corner of the junction of Euston Road and Midland Road           | 530074, 182818                    | Test 1, test 2, test 3                      | -                        |
| 1-44     | University College London, Drayton House, Gordon Street                                   | 529589, 182467                    | Test 1, test 2, test 3                      | -                        |
| 1-45     | 33, Arlington Road  | 529019, 183458                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-46     | Clifton Court, Northwick Terrace  | 526511, 182336                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-47     | 16, Upper Woburn Place  | 529780, 182542                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-48     | Dora House 60, St. Johns Wood Road  | 527076, 182779                    | Test 2, test 3                              | Test 2, test 3           |
| 1-49     | 173, Euston Road  | 529667, 182516                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-50     | Property at the junction of Gray's Inn Road and Pentonville Road                          | 530363, 182984                    | Test 1, test 2, test 3                      | -                        |
| 1-51     | Property at the junction of Granby Terrace and Park Village East                          | 529025, 183055                    | Test 1, test 2,                             | -                        |
| 1-52     | Property on Melton Street, between Drummond Street and Euston Street                      | 529476, 182599                    | Test 1, test 2, test 3                      | -                        |
| 1-53     | Property at the southern corner of the junction of Southampton Row and Vernon Place       | 530451, 181656                    | Test 1, test 2, test 3                      | -                        |

| Receptor | Description/location   | Ordnance<br>Survey<br>coordinates | Scenarios assessed with the Proposed Scheme |                          |
|----------|--|-----------------------------------|---|--------------------------|
|          |  |                                   | DMRB assessment                             | ADMS-Roads<br>assessment |
| 1-54     | Property at the western corner of the junction of Marylebone Road and Macfarren Place        | 528368, 182112                    | Test 1, test 2, test 3                      | -                        |
| 1-55     | Property on the junction of Tavistock Square and Gordon Square                               | 529888, 182254                    | Test 1, test 2, test 3                      | -                        |
| 1-56     | Property at the western corner of the junction of Pancras Road and St Pancras Way            | 529629, 183500                    | Test 3                                      | -                        |
| 1-57     | Property opposite the junction of Park Village East and Mornington Street                    | 528831, 183318                    | Test 1, test 2,                             | -                        |
| 1-58     | Property at the southern corner of the junction of Delancey Street and Arlington Road        | 528930, 183610                    | Test 3                                      | -                        |
| 1-59     | Property at the western corner of the junction of Strand and Surrey Street                   | 530847, 180947                    | Test 1, test 2, test 3                      | -                        |
| 1-60     | Property opposite the junction of Acton Street and Gray's Inn Road                           | 530564, 182706                    | Test 1, test 2, test 3                      | -                        |
| 1-61     | Property at the junction of Woburn Place and Bernard Street                                  | 530117, 182126                    | Test 1, test 2, test 3                      | -                        |
| 1-62     | 8A, Wellington Place   | 526823, 183156                    | Test 2, test 3                              | Test 2, test 3           |
| 1-63     | Property on Midland Road, near Neville Close   | 529905, 183243                    | Test 1, test 2,                             | -                        |
| 1-64     | Property on Park Village East, near Mornington Street  | 528837, 182689                    | Test 2, test 3                              | -                        |
| 1-65     | Property at the southern corner of the junction of King's Cross Road and Swinton Street      | 530787, 182836                    | Test 1, test 2, test 3                      | -                        |
| 1-66     | St. Johns House, St. Johns Wood High Street  | 527199, 182916                    | Test 1, test 2, test 3                      | Test 2, test 3           |
| 1-67     | Mercury Court 4, Eversholt Street  | 529715, 182669                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-68     | Property at the southern corner of the junction of Tottenham Court Road and Torrington Place | 529490, 181929                    | Test 1, test 2, test 3                      | -                        |
| 1-69     | Unison Centre 130, Euston Road   | 529845, 182661                    | Test 1, test 2, test 3                      | Test 1, test 2, test 3   |
| 1-70     | Property at the northern corner of the junction of Gloucester Gate and Outer Circle          | 528549, 183445                    | Test 2,                                     | -                        |
| 1-71     | Property at the northern corner of the junction of Hampstead Road and Robert Street          | 529172, 182719                    | Test 1, test 2, test 3                      | -                        |
| 1-72     | Property at the junction of Hampstead Road and Varndell Street                               | 529190, 182797                    | Test 1, test 2, test 3                      | -                        |

| Receptor | Description/location   | Ordnance Survey coordinates | Scenarios assessed with the Proposed Scheme |                        |
|----------|--|-----------------------------|---|------------------------|
|          |  |                             | DMRB assessment                             | ADMS-Roads assessment  |
| 1-73     | Property at the northern corner of the junction of Camden High Street and Plender Street | 529139, 183544              | Test 1, test 2,                             | -                      |
| 1-74     | Property on Robert Street, near Cumberland Market  | 529095, 182716              | Test 1, test 2, test 3                      | -                      |
| 1-75     | Property at the junction of Gordon Square and Byng Place                                 | 529745, 182189              | Test 1, test 2, test 3                      | -                      |
| 1-76     | Property at the junction of Granby Terrace and Stanhope Street                           | 529045, 183044              | Test 1, test 2, test 3                      | -                      |
| 1-77     | Property at the eastern corner of the junction of Guilford Street and Grenville Street   | 530397, 182135              | Test 1, test 2, test 3                      | -                      |
| 1-78     | Property at the junction of Malet Street and Keppel Street                               | 529857, 181861              | Test 1, test 2, test 3                      | -                      |
| 1-79     | Walker House, Phoenix Road   | 529714, 183122              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-80     | Property at the southern corner of the junction of Phoenix Road and Chalton Street       | 529680, 182970              | Test 1, test 2, test 3                      | -                      |
| 1-81     | Property at the southern corner of the junction of Southampton Row and Bloomsbury Place  | 530377, 181766              | Test 1, test 2, test 3                      | -                      |
| 1-82     | 73-77, Euston Road   | 530089, 182763              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-83     | Property at the junction of Great Portland Street and Osnaburgh Street                   | 528858, 182111              | Test 1, test 2,                             | -                      |
| 1-84     | Property at the northern corner of the junction of Eversholt Street and Oakley Square    | 529303, 183268              | Test 1, test 2, test 3                      | -                      |
| 1-85     | 118, Eversholt Street  | 529487, 182991              | Test 1, test 2, test 3                      | Test 1, test 2, test 3 |
| 1-86     | Property at the junction of Parkway and Park Village East                                | 528644, 183530              | Test 1, test 2, test 3                      | -                      |
| 1-87     | Property at the eastern corner of the junction of Bayham Street and Plender Street       | 529174, 183562              | Test 1, test 2, test 3                      | -                      |
| 1-138    | Reynolds House, Wellington Road  | 526861, 183163              | -   | Test 2, test 3         |
| 1-139    | 14, Wellington Road  | 526939, 183060              | -   | Test 2, test 3         |
| 1-140    | 149, Park Road   | 527175, 182801              | -   | Test 2, test 3         |
| 1-141    | St. Johns Hall, St. Johns Wood High Street   | 527178, 182889              | -   | Test 2, test 3         |
| 1-142    | St. Johns House, St. Johns Wood High Street  | 527208, 182938              | -   | Test 2, test 3         |
| 1-143    | Grove End House, Grove End Road  | 526734, 182558              | -   | Test 2, test 3         |

| Receptor | Description/location                       | Ordnance Survey coordinates | Scenarios assessed with the Proposed Scheme |                        |
|----------|--|-----------------------------|---|------------------------|
|          |  |                             | DMRB assessment                             | ADMS-Roads assessment  |
| 1-144    | Century Court , Grove End Road             | 526763,182577               | -   | Test 2, test 3         |
| 1-145    | St. Johns Wood Court , St. Johns Wood Road | 526784,182549               | -   | Test 2, test 3         |
| 1-146    | Clifton Court , Northwick Terrace          | 526511,182336               | -   | Test 1, test 2, test 3 |
| 1-147    | 25, St. Johns Wood Road                    | 526566,182420               | -   | Test 1, test 2, test 3 |
| 1-148    | 12, St. Johns Wood Road                    | 526611,182416               | -   | Test 1, test 2, test 3 |
| 1-149    | Clifton Court , Northwick Terrace          | 526586,182240               | -   | Test 2, test 3         |
| 1-150    | 506, Edgware Road                          | 526610,182203               | -   | Test 2, test 3         |
| 1-151    | 464, Edgware Road                          | 526705,182098               | -   | Test 2, test 3         |
| 1-152    | 384, Edgware Road                          | 526886,181912               | -   | Test 2, test 3         |
| 1-153    | 352, Edgware Road                          | 526953,181840               | -   | Test 2, test 3         |
| 1-154    | 332, Edgware Road                          | 526983,181804               | -   | Test 2, test 3         |
| 1-155    | 306, Edgware Road                          | 527048,181729               | -   | Test 2, test 3         |
| 1-156    | 1-5 , Cosway Street                        | 527353,181814               | -   | Test 1, test 2, test 3 |
| 1-157    | 49, Lisson Street                          | 527235,181777               | -   | Test 2, test 3         |
| 1-158    | George Peabody Court 2, Burne Street       | 527177,181756               | -   | Test 2, test 3         |
| 1-159    | 248, Marylebone Road                       | 527467,181849               | -   | Test 1, test 2, test 3 |
| 1-160    | North West House 119-127 , Marylebone Road | 527670,181867               | -   | Test 1, test 2, test 3 |
| 1-161    | 1, Albany Street                           | 528827,182303               | -   | Test 1, test 2, test 3 |
| 1-162    | 1, Albany Street                           | 528850,182293               | -   | Test 1, test 2, test 3 |
| 1-163    | 40, Hampstead Road                         | 529232,182479               | -   | Test 1, test 2, test 3 |
| 1-164    | 144, Drummond Street                       | 529232,182494               | -   | Test 1, test 2, test 3 |
| 1-165    | 70, Hampstead Road                         | 529231,182520               | -   | Test 1, test 2, test 3 |
| 1-166    | 190-198 , North Gower Street               | 529312,182539               | -   | Test 1, test 2, test 3 |
| 1-167    | 213, North Gower Street                    | 529296,182529               | -   | Test 1, test 2, test 3 |
| 1-168    | 203-209 , North Gower Street               | 529304,182516               | -   | Test 1, test 2, test 3 |
| 1-169    | 92-94 , Drummond Street                    | 529391,182592               | -   | Test 1, test 2, test 3 |
| 1-170    | 152-156 , North Gower Street               | 529429,182375               | -   | Test 1, test 2, test 3 |
| 1-171    | 215, Euston Road                           | 529470,182400               | -   | Test 1, test 2, test 3 |
| 1-172    | 183-193 , Euston Road                      | 529513,182425               | -   | Test 1, test 2, test 3 |
| 1-173    | Drayton House 30, Gordon Street            | 529589,182468               | -   | Test 1, test 2, test 3 |



| Receptor | Description/location              | Ordnance<br>Survey<br>coordinates | Scenarios assessed with the Proposed Scheme |                          |
|----------|-----------------------------------|-----------------------------------|---|--------------------------|
|          |                                   |                                   | DMRB assessment                             | ADMS-Roads<br>assessment |
| 1-174    | 173, Euston Road                  | 529667,182516                     | -   | Test 1, test 2, test 3   |
| 1-175    | 16, Upper Woburn Place            | 529780,182545                     | -   | Test 1, test 2, test 3   |
| 1-176    | 16, Upper Woburn Place            | 529780,182542                     | -   | Test 1, test 2, test 3   |
| 1-177    | 165, Euston Road                  | 529744,182562                     | -   | Test 1, test 2, test 3   |
| 1-178    | 69, Euston Square                 | 529754,182618                     | -   | Test 1, test 2, test 3   |
| 1-179    | Mercury Court 4, Eversholt Street | 529715,182670                     | -   | Test 1, test 2, test 3   |
| 1-180    | 122, Euston Road                  | 529894,182688                     | -   | Test 1, test 2, test 3   |
| 1-181    | Unison Centre 130, Euston Road    | 529845,182662                     | -   | Test 1, test 2, test 3   |
| 1-182    | 73-77, Euston Road                | 530066,182771                     | -   | Test 1, test 2, test 3   |
| 1-183    | 341, Gray's Inn Road              | 530351,182957                     | -   | Test 1, test 2, test 3   |
| 1-184    | 378, Gray's Inn Road              | 530368,182979                     | -   | Test 1, test 2, test 3   |
| 1-185    | 44, Doric Way                     | 529649,182764                     | -   | Test 1, test 2, test 3   |
| 1-186    | 70B, Eversholt Street             | 529591,182842                     | -   | Test 1, test 2, test 3   |
| 1-187    | 70B, Eversholt Street             | 529584,182853                     | -   | Test 1, test 2, test 3   |
| 1-188    | 118, Eversholt Street             | 529494,182979                     | -   | Test 1, test 2, test 3   |
| 1-189    | 118, Eversholt Street             | 529487,182991                     | -   | Test 1, test 2, test 3   |
| 1-190    | Beckfoot, Amptill Square          | 529386,183003                     | -   | Test 1, test 2, test 3   |
| 1-191    | 1, Aldenham Street                | 529447,183045                     | -   | Test 1, test 2, test 3   |
| 1-192    | 184A, Eversholt Street            | 529379,183143                     | -   | Test 1, test 2, test 3   |
| 1-193    | 37, Mornington Crescent           | 529094,183357                     | -   | Test 1, test 2, test 3   |
| 1-194    | 8-10, Arlington Road              | 529077,183388                     | -   | Test 1, test 2, test 3   |
| 1-195    | 31, Arlington Road                | 529029,183442                     | -   | Test 1, test 2, test 3   |
| 1-196    | Metro House 36, Arlington Road    | 529048,183441                     | -   | Test 1, test 2, test 3   |
| 1-197    | 15, Arlington Road                | 529050,183403                     | -   | Test 1, test 2, test 3   |
| 1-198    | 40, Arlington Road                | 529031,183473                     | -   | Test 1, test 2, test 3   |
| 1-199    | 251B, Gray's Inn Road             | 530521,182772                     | -   | Test 1, test 2, test 3   |
| 1-200    | 322A, Gray's Inn Road             | 530548,182772                     | -   | Test 1, test 2, test 3   |
| 1-201    | 279, Gray's Inn Road              | 530485,182839                     | -   | Test 1, test 2, test 3   |
| 1-202    | 366, Gray's Inn Road              | 530468,182934                     | -   | Test 1, test 2, test 3   |
| 1-203    | 1, Kings Cross Bridge             | 530429,182964                     | -   | Test 1, test 2, test 3   |
| 1-204    | 313, Gray's Inn Road              | 530433,182930                     | -   | Test 1, test 2, test 3   |
| 1-205    | 370, Gray's Inn Road              | 530402,182970                     | -   | Test 1, test 2, test 3   |

| Receptor | Description/location                  | Ordnance Survey coordinates | Scenarios assessed with the Proposed Scheme |                        |
|----------|---------------------------------------|-----------------------------|---|------------------------|
|          |                                       |                             | DMRB assessment                             | ADMS-Roads assessment  |
| 1-206    | 325, Gray's Inn Road                  | 530399,182948               | -   | Test 1, test 2, test 3 |
| 1-207    | Oakshott Court , Polygon Road         | 529631,183067               | -   | Test 1, test 2, test 3 |
| 1-208    | 43C , Polygon Road                    | 529618,183080               | -   | Test 1, test 2, test 3 |
| 1-209    | Oakshott Court , Polygon Road         | 529568,183025               | -   | Test 1, test 2, test 3 |
| 1-210    | 18, Polygon Road                      | 529542,183012               | -   | Test 1, test 2, test 3 |
| 1-211    | St. Margarets House , Polygon Road    | 529534,183026               | -   | Test 1, test 2, test 3 |
| 1-212    | Monica Shaw Court 31, Purchase Street | 529732,183137               | -   | Test 1, test 2, test 3 |
| 1-213    | Monica Shaw Court 31, Purchase Street | 529755,183101               | -   | Test 1, test 2, test 3 |

## Background concentrations

5.3.5 The background concentrations used in the DMRB and ADMS-Roads assessments are shown in Table 10 and Table 11 taken from the Defra maps<sup>26</sup>.

Table 10: Background 2012 concentrations at assessed receptors

| Receptor (or zone of receptors)   | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|---|-------------------------------------|-----------------|------------------|
|   | NO <sub>x</sub>                     | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-1) 122, Euston Road  | 102.3                               | 51.0            | 23.9             |
| (1-2) Property at the southern corner of the junction of Hampstead Road and Mornington Crescent | 76.7                                | 40.7            | 22.2             |
| (1-3) 44, Doric Way   | 102.3                               | 51.0            | 23.9             |
| (1-4) Cruciform Building, University College London, Grafton Way                                | 102.3                               | 51.0            | 23.9             |
| (1-5) 40, Hampstead Road  | 102.3                               | 51.0            | 23.9             |
| (1-6) Property at the junction of Kingsway and High Holborn (Sainsbury's)                       | 116.4                               | 56.4            | 24.1             |
| (1-7) Property at the junction of Bernard Street and Hunter Street                              | 94.7                                | 48.6            | 23.3             |
| (1-8) Hunstanton House , Cosway Street  | 104.3                               | 51.9            | 24.2             |
| (1-9) 37, Mornington Crescent   | 76.7                                | 40.7            | 22.2             |
| (1-10) Winchelsea House , St. Johns Wood Road   | 72.4                                | 39.1            | 21.4             |
| (1-11) Grove House ( junction of Park Road and Prince Albert Road, near roundabout)             | 73.9                                | 39.7            | 21.8             |
| (1-12) Property at the junction of Southampton Row and Russell Square                           | 116.4                               | 56.4            | 24.1             |
| (1-13) Property on the northern corner of the junction of Prince Albert Road and Avenue Road    | 61.9                                | 34.8            | 20.1             |
| (1-14) Property at the junction of Harrington Square and  | 76.7                                | 40.7            | 22.2             |

| Receptor (or zone of receptors)  | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|--|-------------------------------------|-----------------|------------------|
|  | NOx                                 | NO <sub>2</sub> | PM <sub>10</sub> |
| Hampstead Road   |                                     |                 |                  |
| (1-15) Beckfoot , Amptill Square   | 76.7                                | 40.7            | 22.2             |
| (1-16) Property south of the Hampstead Road Bridge (near Harrington Street)                      | 76.7                                | 40.7            | 22.2             |
| (1-17) Property opposite the junction of Edward Mews and Redhill Street                          | 67.5                                | 37.1            | 21.0             |
| (1-18) Clifton Court, Northwick Terrace  | 72.4                                | 39.1            | 21.4             |
| (1-19) Property at the northern corner of the junction of Lidlington Place and Eversholt Street  | 76.7                                | 40.7            | 22.2             |
| (1-20) Property at the northern corner of the junction of Marylebone Road and Gloucester Place   | 104.3                               | 51.9            | 24.2             |
| (1-21) 506, Edgware Road   | 72.4                                | 39.1            | 21.4             |
| (1-22) 1, Albany Street  | 82.1                                | 43.0            | 22.5             |
| (1-23) Property at the southern corner of the junction of King's Cross Road and Frederick Street | 94.7                                | 48.6            | 23.3             |
| (1-24) 183-193, Euston Road  | 102.3                               | 51.0            | 23.9             |
| (1-25) 306, Edgware Road   | 104.3                               | 51.9            | 24.2             |
| (1-26) Property opposite the junction of Albany Street and Gloucester Gate Mews                  | 67.5                                | 37.1            | 21.0             |
| (1-27) Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 76.7                                | 40.7            | 22.2             |
| (1-28) University College Hospital, Gower Street   | 102.3                               | 51.0            | 23.9             |
| (1-29) 251B, Gray's Inn Road   | 94.7                                | 48.6            | 23.3             |
| (1-30) 343, Gray's Inn Road  | 94.7                                | 48.6            | 23.3             |
| (1-31) Property opposite the junction of Woburn Walk and Upper Woburn Place                      | 102.3                               | 51.0            | 23.9             |
| (1-32) Property at junction of Park Square West and Marylebone Road                              | 82.1                                | 43.0            | 22.5             |
| (1-33) 248, Marylebone Road  | 104.3                               | 51.9            | 24.2             |
| (1-34) Property at the southern corner of the junction of Pratt Street and St Pancras Way        | 76.7                                | 40.7            | 22.2             |
| (1-35) Property at the northern corner of the junction of Euston Road and North Gower Street     | 102.3                               | 51.0            | 23.9             |
| (1-36) Beacon House, property at the junction of Kingsway and Parker Street                      | 116.4                               | 56.4            | 24.1             |
| (1-37) Portman Mansions, junction of Marylebone Road and Chiltern Street                         | 110.2                               | 53.5            | 24.2             |
| (1-38) Property opposite the junction of Great Portland Street                                   | 110.2                               | 53.5            | 24.2             |

| Receptor (or zone of receptors)  | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|--|-------------------------------------|-----------------|------------------|
|  | NO <sub>x</sub>                     | NO <sub>2</sub> | PM <sub>10</sub> |
| and Clipstone Street   |                                     |                 |                  |
| (1-39) Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 76.7                                | 40.7            | 22.2             |
| (1-40) Property at the southern corner of the junction of Guilford Street and Russell Square     | 94.7                                | 48.6            | 23.3             |
| (1-41) Property at the western corner of the junction of Gower Street and Torrington Place       | 102.3                               | 51.0            | 23.9             |
| (1-42) Property at the junction of Park Square East and Marylebone Road                          | 82.1                                | 43.0            | 22.5             |
| (1-43) Property at the northern corner of the junction of Euston Road and Midland Road           | 94.7                                | 48.6            | 23.3             |
| (1-44) University College London, Drayton House, Gordon Street                                   | 102.3                               | 51.0            | 23.9             |
| (1-45) 33, Arlington Road  | 76.7                                | 40.7            | 22.2             |
| (1-46) Clifton Court, Northwick Terrace  | 72.4                                | 39.1            | 21.4             |
| (1-47) 16, Upper Woburn Place  | 102.3                               | 51.0            | 23.9             |
| (1-48) Dora House 60, St. Johns Wood Road  | 73.9                                | 39.7            | 21.8             |
| (1-49) 173, Euston Road  | 102.3                               | 51.0            | 23.9             |
| (1-50) Property at the junction of Gray's Inn Road and Pentonville Road                          | 94.7                                | 48.6            | 23.3             |
| (1-51) Property at the junction of Granby Terrace and Park Village East                          | 76.7                                | 40.7            | 22.2             |
| (1-52) Property on Melton Street, between Drummond Street and Euston Street                      | 102.3                               | 51.0            | 23.9             |
| (1-53) Property at the southern corner of the junction of Southampton Row and Vernon Place       | 116.4                               | 56.4            | 24.1             |
| (1-54) Property at the western corner of the junction of Marylebone Road and Macfarren Place     | 82.1                                | 43.0            | 22.5             |
| (1-55) Property on the junction of Tavistock Square and Gordon Square                            | 102.3                               | 51.0            | 23.9             |
| (1-56) Property at the western corner of the junction of Pancras Road and St Pancras Way         | 76.7                                | 40.7            | 22.2             |
| (1-57) Property opposite the junction of Park Village East and Mornington Street                 | 67.5                                | 37.1            | 21.0             |
| (1-58) Property at the southern corner of the junction of Delancey Street and Arlington Road     | 67.5                                | 37.1            | 21.0             |
| (1-59) Property at the western corner of the junction of Strand and Surrey Street                | 123.3                               | 59.0            | 24.0             |
| (1-60) Property opposite the junction of Acton Street and Gray's Inn Road                        | 94.7                                | 48.6            | 23.3             |

| Receptor (or zone of receptors)   | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-61) Property at the junction of Woburn Place and Bernard Street                                  | 94.7  | 48.6            | 23.3             |
| (1-62) 8A, Wellington Place   | 69.3  | 37.8            | 20.8             |
| (1-63) Property on Midland Road, near Neville Close   | 76.7  | 40.7            | 22.2             |
| (1-64) Property on Park Village East, near Mornington Street  | 82.1  | 43.0            | 22.5             |
| (1-65) Property at the southern corner of the junction of King's Cross Road and Swinton Street      | 94.7  | 48.6            | 23.3             |
| (1-66) St. Johns House, St. Johns Wood High Street  | 73.9  | 39.7            | 21.8             |
| (1-67) Mercury Court 4, Eversholt Street  | 102.3                                       | 51.0            | 23.9             |
| (1-68) Property at the southern corner of the junction of Tottenham Court Road and Torrington Place | 117.4                                       | 55.8            | 24.3             |
| (1-69) Unison Centre 130, Euston Road   | 102.3                                       | 51.0            | 23.9             |
| (1-70) Property at the northern corner of the junction of Gloucester Gate and Outer Circle          | 67.5  | 37.1            | 21.0             |
| (1-71) Property at the northern corner of the junction of Hampstead Road and Robert Street          | 102.3                                       | 51.0            | 23.9             |
| (1-72) Property at the junction of Hampstead Road and Varndell Street                               | 102.3                                       | 51.0            | 23.9             |
| (1-73) Property at the northern corner of the junction of Camden High Street and Plender Street     | 76.7  | 40.7            | 22.2             |
| (1-74) Property on Robert Street, near Cumberland Market  | 102.3                                       | 51.0            | 23.9             |
| (1-75) Property at the junction of Gordon Square and Byng Place                                     | 102.3                                       | 51.0            | 23.9             |
| (1-76) Property at the junction of Granby Terrace and Stanhope Street                               | 76.7  | 40.7            | 22.2             |
| (1-77) Property at the eastern corner of the junction of Guilford Street and Grenville Street       | 94.7  | 48.6            | 23.3             |
| (1-78) Property at the junction of Malet Street and Keppel Street                                   | 117.4                                       | 55.8            | 24.3             |
| (1-79) Walker House, Phoenix Road   | 76.7  | 40.7            | 22.2             |
| (1-80) Property at the southern corner of the junction of Phoenix Road and Chalton Street           | 102.3                                       | 51.0            | 23.9             |
| (1-81) Property at the southern corner of the junction of Southampton Row and Bloomsbury Place      | 116.4                                       | 56.4            | 24.1             |
| (1-82) 73-77, Euston Road   | 94.7  | 48.6            | 23.3             |
| (1-83) Property at the junction of Great Portland Street and Osnaburgh Street                       | 82.1  | 43.0            | 22.5             |
| (1-84) Property at the northern corner of the junction of Eversholt Street and Oakley Square        | 76.7  | 40.7            | 22.2             |
| (1-85) 118, Eversholt Street  | 102.3                                       | 51.0            | 23.9             |

| Receptor (or zone of receptors)   | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-86) Property at the junction of Parkway and Park Village East                          | 67.5  | 37.1            | 21.0             |
| (1-87) Property at the eastern corner of the junction of Bayham Street and Plender Street | 76.7  | 40.7            | 22.2             |
| (1-138) Reynolds House, Wellington Road   | 69.3  | 37.8            | 20.8             |
| (1-139) 14, Wellington Road   | 69.3  | 37.8            | 20.8             |
| (1-140) 149, Park Road  | 73.9  | 39.7            | 21.8             |
| (1-141) St. Johns Hall, St. Johns Wood High Street  | 73.9  | 39.7            | 21.8             |
| (1-142) St. Johns House, St. Johns Wood High Street                                       | 73.9  | 39.7            | 21.8             |
| (1-143) Grove End House, Grove End Road   | 72.4  | 39.1            | 21.4             |
| (1-144) Century Court, Grove End Road   | 72.4  | 39.1            | 21.4             |
| (1-145) St. Johns Wood Court, St. Johns Wood Road   | 72.4  | 39.1            | 21.4             |
| (1-146) Clifton Court, Northwick Terrace  | 72.4  | 39.1            | 21.4             |
| (1-147) 25, St. Johns Wood Road   | 72.4  | 39.1            | 21.4             |
| (1-148) 12, St. Johns Wood Road   | 72.4  | 39.1            | 21.4             |
| (1-149) Clifton Court, Northwick Terrace  | 72.4  | 39.1            | 21.4             |
| (1-150) 506, Edgware Road   | 72.4  | 39.1            | 21.4             |
| (1-151) 464, Edgware Road   | 72.4  | 39.1            | 21.4             |
| (1-152) 384, Edgware Road   | 93.3  | 47.7            | 23.3             |
| (1-153) 352, Edgware Road   | 93.3  | 47.7            | 23.3             |
| (1-154) 332, Edgware Road   | 93.3  | 47.7            | 23.3             |
| (1-155) 306, Edgware Road   | 104.3                                       | 52.0            | 24.2             |
| (1-156) 1-5, Cosway Street  | 104.3                                       | 52.0            | 24.2             |
| (1-157) 49, Lisson Street   | 104.3                                       | 52.0            | 24.2             |
| (1-158) George Peabody Court 2, Burne Street  | 104.3                                       | 52.0            | 24.2             |
| (1-159) 248, Marylebone Road  | 104.3                                       | 52.0            | 24.2             |
| (1-160) North West House 119-127, Marylebone Road   | 104.3                                       | 52.0            | 24.2             |
| (1-161) 1, Albany Street  | 82.1  | 43.0            | 22.5             |
| (1-162) 1, Albany Street  | 82.1  | 43.0            | 22.5             |
| (1-163) 40, Hampstead Road  | 102.3                                       | 51.0            | 23.9             |
| (1-164) 144, Drummond Street  | 102.3                                       | 51.0            | 23.9             |
| (1-165) 70, Hampstead Road  | 102.3                                       | 51.0            | 23.9             |
| (1-166) 190-198, North Gower Street   | 102.3                                       | 51.0            | 23.9             |
| (1-167) 213, North Gower Street   | 102.3                                       | 51.0            | 23.9             |

| Receptor (or zone of receptors)           | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|---|-------------------------------------|-----------------|------------------|
|   | NO <sub>x</sub>                     | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-168) 203-209, North Gower Street       | 102.3                               | 51.0            | 23.9             |
| (1-169) 92-94, Drummond Street            | 102.3                               | 51.0            | 23.9             |
| (1-170) 152-156, North Gower Street       | 102.3                               | 51.0            | 23.9             |
| (1-171) 215, Euston Road                  | 102.3                               | 51.0            | 23.9             |
| (1-172) 183-193, Euston Road              | 102.3                               | 51.0            | 23.9             |
| (1-173) Drayton House 30, Gordon Street   | 102.3                               | 51.0            | 23.9             |
| (1-174) 173, Euston Road                  | 102.3                               | 51.0            | 23.9             |
| (1-175) 16, Upper Woburn Place            | 102.3                               | 51.0            | 23.9             |
| (1-176) 16, Upper Woburn Place            | 102.3                               | 51.0            | 23.9             |
| (1-177) 165, Euston Road                  | 102.3                               | 51.0            | 23.9             |
| (1-178) 69, Euston Square                 | 102.3                               | 51.0            | 23.9             |
| (1-179) Mercury Court 4, Eversholt Street | 102.3                               | 51.0            | 23.9             |
| (1-180) 122, Euston Road                  | 102.3                               | 51.0            | 23.9             |
| (1-181) Unison Centre 130, Euston Road    | 102.3                               | 51.0            | 23.9             |
| (1-182) 73-77, Euston Road                | 94.7                                | 48.6            | 23.3             |
| (1-183) 341, Gray's Inn Road              | 94.7                                | 48.6            | 23.3             |
| (1-184) 378, Gray's Inn Road              | 94.7                                | 48.6            | 23.3             |
| (1-185) 44, Doric Way                     | 102.3                               | 51.0            | 23.9             |
| (1-186) 70B, Eversholt Street             | 102.3                               | 51.0            | 23.9             |
| (1-187) 70B, Eversholt Street             | 102.3                               | 51.0            | 23.9             |
| (1-188) 118, Eversholt Street             | 102.3                               | 51.0            | 23.9             |
| (1-189) 118, Eversholt Street             | 102.3                               | 51.0            | 23.9             |
| (1-190) Beckfoot, Amptill Square          | 76.7                                | 40.7            | 22.2             |
| (1-191) 1, Aldenham Street                | 76.7                                | 40.7            | 22.2             |
| (1-192) 184A, Eversholt Street            | 76.7                                | 40.7            | 22.2             |
| (1-193) 37, Mornington Crescent           | 76.7                                | 40.7            | 22.2             |
| (1-194) 8-10, Arlington Road              | 76.7                                | 40.7            | 22.2             |
| (1-195) 31, Arlington Road                | 76.7                                | 40.7            | 22.2             |
| (1-196) Metro House 36, Arlington Road    | 76.7                                | 40.7            | 22.2             |
| (1-197) 15, Arlington Road                | 76.7                                | 40.7            | 22.2             |
| (1-198) 40, Arlington Road                | 76.7                                | 40.7            | 22.2             |
| (1-199) 251B, Gray's Inn Road             | 94.7                                | 48.6            | 23.3             |

| Receptor (or zone of receptors)               | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NO <sub>x</sub>                             | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-200) 322A, Gray's Inn Road                 | 94.7  | 48.6            | 23.3             |
| (1-201) 279, Gray's Inn Road                  | 94.7  | 48.6            | 23.3             |
| (1-202) 366, Gray's Inn Road                  | 94.7  | 48.6            | 23.3             |
| (1-203) 1, Kings Cross Bridge                 | 94.7  | 48.6            | 23.3             |
| (1-204) 313, Gray's Inn Road                  | 94.7  | 48.6            | 23.3             |
| (1-205) 370, Gray's Inn Road                  | 94.7  | 48.6            | 23.3             |
| (1-206) 325, Gray's Inn Road                  | 94.7  | 48.6            | 23.3             |
| (1-207) Oakshott Court, Polygon Road          | 76.7  | 40.7            | 22.2             |
| (1-208) 43C, Polygon Road                     | 76.7  | 40.7            | 22.2             |
| (1-209) Oakshott Court, Polygon Road          | 76.7  | 40.7            | 22.2             |
| (1-210) 18, Polygon Road                      | 76.7  | 40.7            | 22.2             |
| (1-211) St. Margarets House, Polygon Road     | 76.7  | 40.7            | 22.2             |
| (1-212) Monica Shaw Court 31, Purchase Street | 76.7  | 40.7            | 22.2             |
| (1-213) Monica Shaw Court 31, Purchase Street | 76.7  | 40.7            | 22.2             |

Table 11: Background 2017 concentrations at assessed receptors

| Receptor (or zone of receptors)   | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NO <sub>x</sub>                             | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-1) 122, Euston Road  | 81.0  | 42.2            | 22.3             |
| (1-2) Property at the southern corner of the junction of Hampstead Road and Mornington Crescent | 61.6  | 34.4            | 20.9             |
| (1-3) 44, Doric Way   | 81.0  | 42.2            | 22.3             |
| (1-4) Cruciform Building, University College London, Grafton Way                                | 81.0  | 42.2            | 22.3             |
| (1-5) 40, Hampstead Road  | 81.0  | 42.2            | 22.3             |
| (1-6) Property at the junction of Kingsway and High Holborn (Sainsbury's)                       | 93.2  | 47.0            | 22.4             |
| (1-7) Property at the junction of Bernard Street and Hunter Street                              | 75.5  | 40.6            | 21.8             |
| (1-8) Hunstanton House, Cosway Street   | 82.3  | 42.8            | 22.6             |
| (1-9) 37, Mornington Crescent   | 61.6  | 34.4            | 20.9             |
| (1-10) Winchelsea House, St. Johns Wood Road  | 58.3  | 33.1            | 20.2             |
| (1-11) Grove House ( junction of Park Road and Prince Albert Road, near roundabout)             | 59.2  | 33.4            | 20.6             |
| (1-12) Property at the junction of Southampton Row and Russell Square                           | 93.2  | 47.0            | 22.4             |



| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-13) Property on the northern corner of the junction of Prince Albert Road and Avenue Road     | 50.1  | 29.4            | 19.0             |
| (1-14) Property at the junction of Harrington Square and Hampstead Road                          | 61.6  | 34.4            | 20.9             |
| (1-15) Beckfoot, Amptill Square  | 61.6  | 34.4            | 20.9             |
| (1-16) Property south of the Hampstead Road Bridge (near Harrington Street)                      | 61.6  | 34.4            | 20.9             |
| (1-17) Property opposite the junction of Edward Mews and Redhill Street                          | 54.3  | 31.3            | 19.8             |
| (1-18) Clifton Court, Northwick Terrace  | 58.3  | 33.1            | 20.2             |
| (1-19) Property at the northern corner of the junction of Lidlington Place and Eversholt Street  | 61.6  | 34.4            | 20.9             |
| (1-20) Property at the northern corner of the junction of Marylebone Road and Gloucester Place   | 82.3  | 42.8            | 22.6             |
| (1-21) 506, Edgware Road   | 58.3  | 33.1            | 20.2             |
| (1-22) 1, Albany Street  | 65.4  | 36.0            | 21.2             |
| (1-23) Property at the southern corner of the junction of King's Cross Road and Frederick Street | 75.5  | 40.6            | 21.8             |
| (1-24) 183-193, Euston Road  | 81.0  | 42.2            | 22.3             |
| (1-25) 306, Edgware Road   | 82.3  | 42.8            | 22.6             |
| (1-26) Property opposite the junction of Albany Street and Gloucester Gate Mews                  | 54.3  | 31.3            | 19.8             |
| (1-27) Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 61.6  | 34.4            | 20.9             |
| (1-28) University College Hospital, Gower Street   | 81.0  | 42.2            | 22.3             |
| (1-29) 251B, Gray's Inn Road   | 75.5  | 40.6            | 21.8             |
| (1-30) 343, Gray's Inn Road  | 75.5  | 40.6            | 21.8             |
| (1-31) Property opposite the junction of Woburn Walk and Upper Woburn Place                      | 81.0  | 42.2            | 22.3             |
| (1-32) Property at junction of Park Square West and Marylebone Road                              | 65.4  | 36.0            | 21.2             |
| (1-33) 248, Marylebone Road  | 82.3  | 42.8            | 22.6             |
| (1-34) Property at the southern corner of the junction of Pratt Street and St Pancras Way        | 61.6  | 34.4            | 20.9             |
| (1-35) Property at the northern corner of the junction of Euston Road and North Gower Street     | 81.0  | 42.2            | 22.3             |
| (1-36) Beacon House, property at the junction of Kingsway and Parker Street                      | 93.2  | 47.0            | 22.4             |

| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-37) Portman Mansions, junction of Marylebone Road and Chiltern Street                         | 88.6  | 44.8            | 22.6             |
| (1-38) Property opposite the junction of Great Portland Street and Clipstone Street              | 88.6  | 44.8            | 22.6             |
| (1-39) Property at the northern corner of the junction of Hampstead Road and Mornington Crescent | 61.6  | 34.4            | 20.9             |
| (1-40) Property at the southern corner of the junction of Guilford Street and Russell Square     | 75.5  | 40.6            | 21.8             |
| (1-41) Property at the western corner of the junction of Gower Street and Torrington Place       | 81.0  | 42.2            | 22.3             |
| (1-42) Property at the junction of Park Square East and Marylebone Road                          | 65.4  | 36.0            | 21.2             |
| (1-43) Property at the northern corner of the junction of Euston Road and Midland Road           | 75.5  | 40.6            | 21.8             |
| (1-44) University College London, Drayton House, Gordon Street                                   | 81.0  | 42.2            | 22.3             |
| (1-45) 33, Arlington Road  | 61.6  | 34.4            | 20.9             |
| (1-46) Clifton Court, Northwick Terrace  | 58.3  | 33.1            | 20.2             |
| (1-47) 16, Upper Woburn Place  | 81.0  | 42.2            | 22.3             |
| (1-48) Dora House 60, St. Johns Wood Road  | 59.2  | 33.4            | 20.6             |
| (1-49) 173, Euston Road  | 81.0  | 42.2            | 22.3             |
| (1-50) Property at the junction of Gray's Inn Road and Pentonville Road                          | 75.5  | 40.6            | 21.8             |
| (1-51) Property at the junction of Granby Terrace and Park Village East                          | 61.6  | 34.4            | 20.9             |
| (1-52) Property on Melton Street, between Drummond Street and Euston Street                      | 81.0  | 42.2            | 22.3             |
| (1-53) Property at the southern corner of the junction of Southampton Row and Vernon Place       | 93.2  | 47.0            | 22.4             |
| (1-54) Property at the western corner of the junction of Marylebone Road and Macfarren Place     | 65.4  | 36.0            | 21.2             |
| (1-55) Property on the junction of Tavistock Square and Gordon Square                            | 81.0  | 42.2            | 22.3             |
| (1-56) Property at the western corner of the junction of Pancras Road and St Pancras Way         | 61.6  | 34.4            | 20.9             |
| (1-57) Property opposite the junction of Park Village East and Mornington Street                 | 54.3  | 31.3            | 19.8             |
| (1-58) Property at the southern corner of the junction of Delancey Street and Arlington Road     | 54.3  | 31.3            | 19.8             |
| (1-59) Property at the western corner of the junction of Strand and Surrey Street                | 98.1  | 48.9            | 22.3             |

| Receptor (or zone of receptors)   | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-60) Property opposite the junction of Acton Street and Gray's Inn Road                           | 75.5  | 40.6            | 21.8             |
| (1-61) Property at the junction of Woburn Place and Bernard Street                                  | 75.5  | 40.6            | 21.8             |
| (1-62) 8A, Wellington Place   | 56.2  | 32.1            | 19.6             |
| (1-63) Property on Midland Road, near Neville Close   | 61.6  | 34.4            | 20.9             |
| (1-64) Property on Park Village East, near Mornington Street  | 65.4  | 36.0            | 21.2             |
| (1-65) Property at the southern corner of the junction of King's Cross Road and Swinton Street      | 75.5  | 40.6            | 21.8             |
| (1-66) St. Johns House, St. Johns Wood High Street  | 59.2  | 33.4            | 20.6             |
| (1-67) Mercury Court 4, Eversholt Street  | 81.0  | 42.2            | 22.3             |
| (1-68) Property at the southern corner of the junction of Tottenham Court Road and Torrington Place | 95.0  | 47.0            | 22.6             |
| (1-69) Unison Centre 130, Euston Road   | 81.0  | 42.2            | 22.3             |
| (1-70) Property at the northern corner of the junction of Gloucester Gate and Outer Circle          | 54.3  | 31.3            | 19.8             |
| (1-71) Property at the northern corner of the junction of Hampstead Road and Robert Street          | 81.0  | 42.2            | 22.3             |
| (1-72) Property at the junction of Hampstead Road and Varndell Street                               | 81.0  | 42.2            | 22.3             |
| (1-73) Property at the northern corner of the junction of Camden High Street and Plender Street     | 61.6  | 34.4            | 20.9             |
| (1-74) Property on Robert Street, near Cumberland Market  | 81.0  | 42.2            | 22.3             |
| (1-75) Property at the junction of Gordon Square and Byng Place                                     | 81.0  | 42.2            | 22.3             |
| (1-76) Property at the junction of Granby Terrace and Stanhope Street                               | 61.6  | 34.4            | 20.9             |
| (1-77) Property at the eastern corner of the junction of Guilford Street and Grenville Street       | 75.5  | 40.6            | 21.8             |
| (1-78) Property at the junction of Malet Street and Keppel Street                                   | 95.0  | 47.0            | 22.6             |
| (1-79) Walker House, Phoenix Road   | 61.6  | 34.4            | 20.9             |
| (1-80) Property at the southern corner of the junction of Phoenix Road and Chalton Street           | 81.0  | 42.2            | 22.3             |
| (1-81) Property at the southern corner of the junction of Southampton Row and Bloomsbury Place      | 93.2  | 47.0            | 22.4             |
| (1-82) 73-77, Euston Road   | 75.5  | 40.6            | 21.8             |
| (1-83) Property at the junction of Great Portland Street and Osnaburgh Street                       | 65.4  | 36.0            | 21.2             |
| (1-84) Property at the northern corner of the junction of Eversholt                                 | 61.6  | 34.4            | 20.9             |

| Receptor (or zone of receptors)   | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|---|-------------------------------------|-----------------|------------------|
|   | NOx                                 | NO <sub>2</sub> | PM <sub>10</sub> |
| Street and Oakley Square  |                                     |                 |                  |
| (1-85) 118, Eversholt Street  | 81.0                                | 42.2            | 22.3             |
| (1-86) Property at the junction of Parkway and Park Village East                          | 54.3                                | 31.3            | 19.8             |
| (1-87) Property at the eastern corner of the junction of Bayham Street and Plender Street | 61.6                                | 34.4            | 20.9             |
| (1-138) Reynolds House, Wellington Road   | 56.2                                | 32.1            | 19.6             |
| (1-139) 14, Wellington Road   | 56.2                                | 32.1            | 19.6             |
| (1-140) 149, Park Road  | 59.2                                | 33.4            | 20.6             |
| (1-141) St. Johns Hall, St. Johns Wood High Street  | 59.2                                | 33.4            | 20.6             |
| (1-142) St. Johns House, St. Johns Wood High Street                                       | 59.2                                | 33.4            | 20.6             |
| (1-143) Grove End House, Grove End Road   | 58.3                                | 33.1            | 20.2             |
| (1-144) Century Court, Grove End Road   | 58.3                                | 33.1            | 20.2             |
| (1-145) St. Johns Wood Court, St. Johns Wood Road   | 58.3                                | 33.1            | 20.2             |
| (1-146) Clifton Court, Northwick Terrace  | 58.3                                | 33.1            | 20.2             |
| (1-147) 25, St. Johns Wood Road   | 58.3                                | 33.1            | 20.2             |
| (1-148) 12, St. Johns Wood Road   | 58.3                                | 33.1            | 20.2             |
| (1-149) Clifton Court, Northwick Terrace  | 58.3                                | 33.1            | 20.2             |
| (1-150) 506, Edgware Road   | 58.3                                | 33.1            | 20.2             |
| (1-151) 464, Edgware Road   | 58.3                                | 33.1            | 20.2             |
| (1-152) 384, Edgware Road   | 75.1                                | 40.0            | 21.9             |
| (1-153) 352, Edgware Road   | 75.1                                | 40.0            | 21.9             |
| (1-154) 332, Edgware Road   | 75.1                                | 40.0            | 21.9             |
| (1-155) 306, Edgware Road   | 82.3                                | 42.8            | 22.6             |
| (1-156) 1-5, Cosway Street  | 82.3                                | 42.8            | 22.6             |
| (1-157) 49, Lisson Street   | 82.3                                | 42.8            | 22.6             |
| (1-158) George Peabody Court 2, Burne Street  | 82.3                                | 42.8            | 22.6             |
| (1-159) 248, Marylebone Road  | 82.3                                | 42.8            | 22.6             |
| (1-160) North West House 119-127, Marylebone Road   | 82.3                                | 42.8            | 22.6             |
| (1-161) 1, Albany Street  | 65.4                                | 36.0            | 21.2             |
| (1-162) 1, Albany Street  | 65.4                                | 36.0            | 21.2             |
| (1-163) 40, Hampstead Road  | 81.0                                | 42.2            | 22.3             |
| (1-164) 144, Drummond Street  | 81.0                                | 42.2            | 22.3             |
| (1-165) 70, Hampstead Road  | 81.0                                | 42.2            | 22.3             |

| Receptor (or zone of receptors)           | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-166) 190-198, North Gower Street       | 81.0  | 42.2            | 22.3             |
| (1-167) 213, North Gower Street           | 81.0  | 42.2            | 22.3             |
| (1-168) 203-209, North Gower Street       | 81.0  | 42.2            | 22.3             |
| (1-169) 92-94, Drummond Street            | 81.0  | 42.2            | 22.3             |
| (1-170) 152-156, North Gower Street       | 81.0  | 42.2            | 22.3             |
| (1-171) 215, Euston Road                  | 81.0  | 42.2            | 22.3             |
| (1-172) 183-193, Euston Road              | 81.0  | 42.2            | 22.3             |
| (1-173) Drayton House 30, Gordon Street   | 81.0  | 42.2            | 22.3             |
| (1-174) 173, Euston Road                  | 81.0  | 42.2            | 22.3             |
| (1-175) 16, Upper Woburn Place            | 81.0  | 42.2            | 22.3             |
| (1-176) 16, Upper Woburn Place            | 81.0  | 42.2            | 22.3             |
| (1-177) 165, Euston Road                  | 81.0  | 42.2            | 22.3             |
| (1-178) 69, Euston Square                 | 81.0  | 42.2            | 22.3             |
| (1-179) Mercury Court 4, Eversholt Street | 81.0  | 42.2            | 22.3             |
| (1-180) 122, Euston Road                  | 81.0  | 42.2            | 22.3             |
| (1-181) Unison Centre 130, Euston Road    | 81.0  | 42.2            | 22.3             |
| (1-182) 73-77, Euston Road                | 75.5  | 40.6            | 21.8             |
| (1-183) 341, Gray's Inn Road              | 75.5  | 40.6            | 21.8             |
| (1-184) 378, Gray's Inn Road              | 75.5  | 40.6            | 21.8             |
| (1-185) 44, Doric Way                     | 81.0  | 42.2            | 22.3             |
| (1-186) 70B, Eversholt Street             | 81.0  | 42.2            | 22.3             |
| (1-187) 70B, Eversholt Street             | 81.0  | 42.2            | 22.3             |
| (1-188) 118, Eversholt Street             | 81.0  | 42.2            | 22.3             |
| (1-189) 118, Eversholt Street             | 81.0  | 42.2            | 22.3             |
| (1-190) Beckfoot, Amptill Square          | 61.6  | 34.4            | 20.9             |
| (1-191) 1, Aldenham Street                | 61.6  | 34.4            | 20.9             |
| (1-192) 184A, Eversholt Street            | 61.6  | 34.4            | 20.9             |
| (1-193) 37, Mornington Crescent           | 61.6  | 34.4            | 20.9             |
| (1-194) 8-10, Arlington Road              | 61.6  | 34.4            | 20.9             |
| (1-195) 31, Arlington Road                | 61.6  | 34.4            | 20.9             |
| (1-196) Metro House 36, Arlington Road    | 61.6  | 34.4            | 20.9             |
| (1-197) 15, Arlington Road                | 61.6  | 34.4            | 20.9             |

| Receptor (or zone of receptors)               | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NO <sub>x</sub>                             | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-198) 40, Arlington Road                    | 61.6  | 34.4            | 20.9             |
| (1-199) 251B , Gray's Inn Road                | 75.5  | 40.6            | 21.8             |
| (1-200) 322A , Gray's Inn Road                | 75.5  | 40.6            | 21.8             |
| (1-201) 279, Gray's Inn Road                  | 75.5  | 40.6            | 21.8             |
| (1-202) 366, Gray's Inn Road                  | 75.5  | 40.6            | 21.8             |
| (1-203) 1, Kings Cross Bridge                 | 75.5  | 40.6            | 21.8             |
| (1-204) 313, Gray's Inn Road                  | 75.5  | 40.6            | 21.8             |
| (1-205) 370, Gray's Inn Road                  | 75.5  | 40.6            | 21.8             |
| (1-206) 325, Gray's Inn Road                  | 75.5  | 40.6            | 21.8             |
| (1-207) Oakshott Court, Polygon Road          | 61.6  | 34.4            | 20.9             |
| (1-208) 43C, Polygon Road                     | 61.6  | 34.4            | 20.9             |
| (1-209) Oakshott Court, Polygon Road          | 61.6  | 34.4            | 20.9             |
| (1-210) 18, Polygon Road                      | 61.6  | 34.4            | 20.9             |
| (1-211) St. Margarets House, Polygon Road     | 61.6  | 34.4            | 20.9             |
| (1-212) Monica Shaw Court 31, Purchase Street | 61.6  | 34.4            | 20.9             |
| (1-213) Monica Shaw Court 31, Purchase Street | 61.6  | 34.4            | 20.9             |

## Design Manual for Roads and Bridges model results

5.3.6 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the Environmental Protection UK (EPUK) methodology<sup>35</sup>.

Table 12: Summary of DMRB annual mean NO<sub>2</sub> results (construction phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |   | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme <sup>36</sup> |   |                     |                     |
| 1-1      | 100.2   | 87.1                         | 92.0                                    | 4.9   | Large               | Substantial adverse |
| 1-2      | 59.8  | 50.2                         | 49.2                                    | -1.0  | Small               | Slight beneficial   |
| 1-3      | 51.2  | 43.4                         | 47.2                                    | 3.8   | Medium              | Moderate adverse    |
| 1-4      | 58.7  | 43.3                         | 44.2                                    | 0.9   | Small               | Slight adverse      |
| 1-5      | 66.8  | 55.2                         | 60.2                                    | 5.0   | Large               | Substantial adverse |
| 1-6      | 108.4   | 88.2                         | 87.8                                    | -0.4  | Small               | Slight beneficial   |
| 1-7      | 53.3  | 42.3                         | 42.6                                    | 0.3   | Imperceptible       | Negligible          |
| 1-8      | 90.9  | 79.3                         | 81.2                                    | 2.0   | Small               | Slight adverse      |
| 1-9      | 42.6  | 37.3                         | 39.1                                    | 1.8   | Small               | Slight adverse      |
| 1-10     | 54.6  | 46.8                         | 48.9                                    | 2.2   | Medium              | Moderate adverse    |
| 1-11     | 61.0  | 50.8                         | 51.9                                    | 1.1   | Small               | Slight adverse      |
| 1-12     | 88.3  | 79.5                         | 79.4                                    | -0.1  | Imperceptible       | Negligible          |
| 1-13     | 48.8  | 41.0                         | 41.2                                    | 0.2   | Imperceptible       | Negligible          |
| 1-14     | 60.8  | 51.0                         | 50.0                                    | -1.0  | Small               | Slight beneficial   |

<sup>35</sup> Environmental Protection UK (EPUK), (2010), *Development Control: Planning for Air Quality*

<sup>36</sup> Concentrations presented represent the highest of the three test scenarios

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |   | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme <sup>36</sup> |   |                     |                     |
| 1-15     | 41.5  | 35.7                         | 40.4                                    | 4.7   | Large               | Substantial adverse |
| 1-16     | 60.4  | 50.9                         | 50.9                                    | 0.0   | Imperceptible       | Negligible          |
| 1-17     | 41.2  | 34.9                         | 35.9                                    | 1.1   | Small               | Negligible          |
| 1-18     | 55.5  | 46.4                         | 48.4                                    | 1.9   | Small               | Slight adverse      |
| 1-19     | 57.9  | 48.5                         | 48.5                                    | 0.0   | Imperceptible       | Negligible          |
| 1-20     | 99.5  | 83.9                         | 85.5                                    | 1.6   | Small               | Slight adverse      |
| 1-21     | 55.0  | 46.2                         | 48.8                                    | 2.5   | Medium              | Moderate adverse    |
| 1-22     | 55.7  | 45.8                         | 47.8                                    | 2.0   | Small               | Slight adverse      |
| 1-23     | 62.9  | 52.4                         | 53.2                                    | 0.7   | Small               | Slight adverse      |
| 1-24     | 90.5  | 78.0                         | 78.9                                    | 0.9   | Small               | Slight adverse      |
| 1-25     | 86.7  | 73.7                         | 75.8                                    | 2.1   | Medium              | Moderate adverse    |
| 1-26     | 49.1  | 41.4                         | 42.6                                    | 1.2   | Small               | Slight adverse      |
| 1-27     | 59.0  | 50.8                         | 49.9                                    | -0.9  | Small               | Slight beneficial   |
| 1-28     | 54.8  | 47.3                         | 47.5                                    | 0.2   | Imperceptible       | Negligible          |
| 1-29     | 92.8  | 78.1                         | 79.7                                    | 1.6   | Small               | Slight adverse      |
| 1-30     | 123.1   | 103.1                        | 105.5                                   | 2.4   | Medium              | Moderate adverse    |
| 1-31     | 72.6  | 66.1                         | 66.6                                    | 0.5   | Small               | Slight adverse      |
| 1-32     | 80.9  | 67.8                         | 68.9                                    | 1.1   | Small               | Slight adverse      |
| 1-33     | 85.0  | 72.6                         | 75.3                                    | 2.7   | Medium              | Moderate adverse    |
| 1-34     | 41.3  | 35.0                         | 34.9                                    | -0.1  | Imperceptible       | Negligible          |



| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |   | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor      |
|----------|---|------------------------------|---|---|---------------------|------------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme <sup>36</sup> |   |                     |                        |
| 1-35     | 50.7  | 43.6                         | 44.7                                    | 1.1   | Small               | Slight adverse         |
| 1-36     | 92.1  | 80.9                         | 80.2                                    | -0.8  | Small               | Slight beneficial      |
| 1-37     | 104.5   | 88.0                         | 89.7                                    | 1.7   | Small               | Slight adverse         |
| 1-38     | 61.3  | 51.3                         | 51.0                                    | -0.3  | Imperceptible       | Negligible             |
| 1-39     | 60.4  | 52.0                         | 51.1                                    | -0.9  | Small               | Slight beneficial      |
| 1-40     | 93.7  | 102.9                        | 99.0                                    | -3.9  | Medium              | Moderate beneficial    |
| 1-41     | 65.2  | 54.4                         | 55.8                                    | 1.3   | Small               | Slight adverse         |
| 1-42     | 103.2   | 86.6                         | 88.4                                    | 1.8   | Small               | Slight adverse         |
| 1-43     | 111.5   | 94.4                         | 96.3                                    | 1.9   | Small               | Slight adverse         |
| 1-44     | 115.3   | 99.4                         | 98.4                                    | -1.0  | Small               | Slight beneficial      |
| 1-45     | 42.2  | 36.1                         | 38.7                                    | 2.5   | Medium              | Moderate adverse       |
| 1-46     | 62.9  | 53.2                         | 57.1                                    | 3.9   | Medium              | Moderate adverse       |
| 1-47     | 107.1   | 95.3                         | 98.6                                    | 3.3   | Medium              | Moderate adverse       |
| 1-48     | 52.2  | 44.1                         | 46.2                                    | 2.2   | Medium              | Moderate adverse       |
| 1-49     | 115.2   | 99.3                         | 104.5                                   | 5.2   | Large               | Substantial adverse    |
| 1-50     | 103.0   | 95.6                         | 97.4                                    | 1.8   | Small               | Slight adverse         |
| 1-51     | 41.6  | 35.3                         | 35.4                                    | 0.1   | Imperceptible       | Negligible             |
| 1-52     | 58.4  | 49.1                         | 41.1                                    | -7.9  | Large               | Substantial beneficial |
| 1-53     | 114.9   | 100.0                        | 97.2                                    | -2.8  | Medium              | Moderate beneficial    |
| 1-54     | 102.5   | 85.0                         | 86.7                                    | 1.7   | Small               | Slight adverse         |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |   | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme <sup>36</sup> |   |                     |                     |
| 1-55     | 70.9  | 59.9                         | 58.4                                    | -1.5  | Small               | Slight beneficial   |
| 1-56     | 50.2  | 42.6                         | 43.0                                    | 0.4   | Small               | Slight adverse      |
| 1-57     | 39.3  | 33.8                         | 34.2                                    | 0.3   | Imperceptible       | Negligible          |
| 1-58     | 45.0  | 36.9                         | 38.2                                    | 1.3   | Small               | Slight adverse      |
| 1-59     | 98.2  | 84.4                         | 84.2                                    | -0.2  | Imperceptible       | Negligible          |
| 1-60     | 63.1  | 52.1                         | 53.0                                    | 1.0   | Small               | Slight adverse      |
| 1-61     | 79.7  | 76.6                         | 72.9                                    | -3.7  | Medium              | Moderate beneficial |
| 1-62     | 59.5  | 49.6                         | 53.1                                    | 3.5   | Medium              | Moderate adverse    |
| 1-63     | 41.5  | 35.4                         | 35.8                                    | 0.4   | Imperceptible       | Negligible          |
| 1-64     | 46.4  | 38.7                         | 38.8                                    | 0.0   | Imperceptible       | Negligible          |
| 1-65     | 73.2  | 60.9                         | 62.0                                    | 1.1   | Small               | Slight adverse      |
| 1-66     | 57.0  | 47.9                         | 49.2                                    | 1.3   | Small               | Slight adverse      |
| 1-67     | 62.4  | 52.9                         | 57.1                                    | 4.1   | Large               | Substantial adverse |
| 1-68     | 73.9  | 62.9                         | 64.0                                    | 1.1   | Small               | Slight adverse      |
| 1-69     | 95.0  | 82.3                         | 86.4                                    | 4.1   | Large               | Substantial adverse |
| 1-70     | 46.8  | 40.8                         | 42.5                                    | 1.7   | Small               | Slight adverse      |
| 1-71     | 58.8  | 49.1                         | 51.1                                    | 2.0   | Small               | Slight adverse      |
| 1-72     | 50.9  | 42.7                         | 41.8                                    | -0.9  | Small               | Slight beneficial   |
| 1-73     | 53.6  | 45.5                         | 45.3                                    | -0.2  | Imperceptible       | Negligible          |
| 1-74     | 55.6  | 46.1                         | 47.6                                    | 1.5   | Small               | Slight adverse      |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |   | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme <sup>36</sup> |   |                     |                     |
| 1-75     | 58.9  | 49.4                         | 46.8                                    | -2.6  | Medium              | Moderate beneficial |
| 1-76     | 41.1  | 35.1                         | 35.7                                    | 0.6   | Small               | Negligible          |
| 1-77     | 54.3  | 43.9                         | 43.2                                    | -0.7  | Small               | Slight beneficial   |
| 1-78     | 59.5  | 50.8                         | 50.3                                    | -0.5  | Small               | Slight beneficial   |
| 1-79     | 41.4  | 35.6                         | 37.9                                    | 2.3   | Medium              | Moderate adverse    |
| 1-80     | 49.6  | 41.2                         | 41.3                                    | 0.1   | Imperceptible       | Negligible          |
| 1-81     | 100.1   | 86.1                         | 84.0                                    | -2.1  | Medium              | Moderate beneficial |
| 1-82     | 126.2   | 105.7                        | 110.8                                   | 5.1   | Large               | Substantial adverse |
| 1-83     | 53.0  | 43.2                         | 43.3                                    | 0.2   | Imperceptible       | Negligible          |
| 1-84     | 52.0  | 44.0                         | 43.7                                    | -0.2  | Imperceptible       | Negligible          |
| 1-85     | 48.1  | 41.5                         | 46.7                                    | 5.3   | Large               | Substantial adverse |
| 1-86     | 48.9  | 42.0                         | 42.4                                    | 0.5   | Small               | Slight adverse      |
| 1-87     | 54.8  | 46.5                         | 46.3                                    | -0.2  | Imperceptible       | Negligible          |

Table 13: Summary of DMRB annual mean PM<sub>10</sub> results (construction phase)

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-1      | 32.8   | 30.3                         | 31.1                      | 0.8   | Small               | Negligible        |
| 1-2      | 25.2   | 23.5                         | 22.9                      | -0.6  | Small               | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-3      | 24.6   | 23.2                         | 23.8                      | 0.5   | Small               | Negligible        |
| 1-4      | 25.3   | 23.1                         | 23.2                      | 0.1   | Imperceptible       | Negligible        |
| 1-5      | 26.6   | 24.7                         | 24.9                      | 0.3   | Imperceptible       | Negligible        |
| 1-6      | 33.3   | 29.3                         | 29.1                      | -0.2  | Imperceptible       | Negligible        |
| 1-7      | 24.3   | 22.4                         | 22.4                      | 0.0   | Imperceptible       | Negligible        |
| 1-8      | 33.6   | 31.2                         | 31.3                      | 0.1   | Imperceptible       | Negligible        |
| 1-9      | 22.6   | 21.4                         | 21.7                      | 0.3   | Imperceptible       | Negligible        |
| 1-10     | 24.2   | 22.7                         | 22.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-11     | 25.2   | 23.3                         | 23.5                      | 0.2   | Imperceptible       | Negligible        |
| 1-12     | 28.7   | 26.6                         | 26.5                      | -0.2  | Imperceptible       | Negligible        |
| 1-13     | 22.7   | 21.2                         | 21.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-14     | 25.4   | 23.8                         | 23.2                      | -0.6  | Small               | Negligible        |
| 1-15     | 22.5   | 21.4                         | 22.2                      | 0.8   | Small               | Negligible        |
| 1-16     | 25.0   | 23.5                         | 22.7                      | -0.8  | Small               | Negligible        |
| 1-17     | 21.9   | 20.7                         | 20.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-18     | 24.0   | 22.5                         | 22.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-19     | 24.2   | 22.7                         | 22.7                      | 0.0   | Imperceptible       | Negligible        |
| 1-20     | 35.7   | 31.5                         | 31.5                      | 0.0   | Imperceptible       | Negligible        |
| 1-21     | 24.1   | 22.8                         | 22.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-22     | 25.2   | 23.4                         | 23.7                      | 0.3   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-23     | 26.1   | 24.3                         | 24.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-24     | 33.5   | 30.2                         | 28.8                      | -1.4  | Small               | Negligible        |
| 1-25     | 31.4   | 28.4                         | 28.6                      | 0.2   | Imperceptible       | Negligible        |
| 1-26     | 23.2   | 21.7                         | 21.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-27     | 24.7   | 23.4                         | 23.3                      | -0.2  | Imperceptible       | Negligible        |
| 1-28     | 24.3   | 22.8                         | 22.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-29     | 31.6   | 28.3                         | 28.7                      | 0.4   | Imperceptible       | Negligible        |
| 1-30     | 37.5   | 32.7                         | 33.2                      | 0.5   | Small               | Negligible        |
| 1-31     | 27.1   | 25.8                         | 26.0                      | 0.2   | Imperceptible       | Negligible        |
| 1-32     | 30.1   | 26.8                         | 26.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-33     | 32.6   | 29.5                         | 29.5                      | 0.0   | Imperceptible       | Negligible        |
| 1-34     | 22.8   | 21.6                         | 21.5                      | 0.0   | Imperceptible       | Negligible        |
| 1-35     | 24.0   | 22.9                         | 23.1                      | 0.2   | Imperceptible       | Negligible        |
| 1-36     | 31.0   | 28.4                         | 28.1                      | -0.2  | Imperceptible       | Negligible        |
| 1-37     | 35.9   | 31.2                         | 31.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-38     | 25.2   | 23.5                         | 23.4                      | -0.1  | Imperceptible       | Negligible        |
| 1-39     | 25.0   | 23.7                         | 23.5                      | -0.2  | Imperceptible       | Negligible        |
| 1-40     | 29.0   | 30.3                         | 29.3                      | -1.0  | Small               | Negligible        |
| 1-41     | 27.1   | 24.8                         | 25.0                      | 0.3   | Imperceptible       | Negligible        |
| 1-42     | 36.0   | 31.2                         | 31.3                      | 0.1   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-43     | 34.2   | 30.5                         | 31.0                      | 0.5   | Small               | Negligible        |
| 1-44     | 41.6   | 35.6                         | 33.8                      | -1.9  | Small               | Negligible        |
| 1-45     | 22.6   | 21.3                         | 21.7                      | 0.4   | Imperceptible       | Negligible        |
| 1-46     | 25.2   | 23.6                         | 23.8                      | 0.2   | Imperceptible       | Negligible        |
| 1-47     | 37.2   | 33.0                         | 33.6                      | 0.6   | Small               | Negligible        |
| 1-48     | 24.1   | 22.6                         | 22.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-49     | 40.9   | 35.1                         | 35.0                      | 0.0   | Imperceptible       | Negligible        |
| 1-50     | 33.9   | 31.4                         | 31.8                      | 0.4   | Imperceptible       | Negligible        |
| 1-51     | 22.5   | 21.2                         | 21.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-52     | 24.9   | 23.3                         | 22.2                      | -1.1  | Small               | Negligible        |
| 1-53     | 35.4   | 31.5                         | 30.6                      | -0.9  | Small               | Negligible        |
| 1-54     | 33.7   | 29.9                         | 29.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-55     | 28.0   | 25.6                         | 25.3                      | -0.3  | Imperceptible       | Negligible        |
| 1-56     | 24.1   | 22.7                         | 22.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-57     | 21.5   | 20.3                         | 20.4                      | 0.0   | Imperceptible       | Negligible        |
| 1-58     | 22.2   | 20.8                         | 21.0                      | 0.2   | Imperceptible       | Negligible        |
| 1-59     | 29.6   | 27.1                         | 27.1                      | -0.1  | Imperceptible       | Negligible        |
| 1-60     | 25.5   | 23.7                         | 23.9                      | 0.2   | Imperceptible       | Negligible        |
| 1-61     | 27.9   | 26.8                         | 26.1                      | -0.7  | Small               | Negligible        |
| 1-62     | 23.8   | 22.1                         | 22.3                      | 0.2   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-63     | 22.7   | 21.6                         | 21.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-64     | 23.5   | 22.1                         | 22.1                      | 0.0   | Imperceptible       | Negligible        |
| 1-65     | 27.9   | 25.9                         | 26.1                      | 0.2   | Imperceptible       | Negligible        |
| 1-66     | 24.8   | 23.2                         | 23.3                      | 0.1   | Imperceptible       | Negligible        |
| 1-67     | 25.8   | 24.1                         | 25.1                      | 1.0   | Small               | Negligible        |
| 1-68     | 27.7   | 25.2                         | 25.5                      | 0.3   | Imperceptible       | Negligible        |
| 1-69     | 31.2   | 28.9                         | 29.6                      | 0.7   | Small               | Negligible        |
| 1-70     | 23.4   | 21.9                         | 22.0                      | 0.1   | Imperceptible       | Negligible        |
| 1-71     | 25.5   | 23.8                         | 23.6                      | -0.2  | Imperceptible       | Negligible        |
| 1-72     | 24.0   | 22.5                         | 22.3                      | -0.1  | Imperceptible       | Negligible        |
| 1-73     | 23.8   | 22.4                         | 22.4                      | 0.0   | Imperceptible       | Negligible        |
| 1-74     | 24.7   | 23.0                         | 22.8                      | -0.2  | Imperceptible       | Negligible        |
| 1-75     | 25.4   | 23.6                         | 23.1                      | -0.5  | Small               | Negligible        |
| 1-76     | 22.4   | 21.1                         | 21.2                      | 0.1   | Imperceptible       | Negligible        |
| 1-77     | 24.4   | 22.6                         | 22.5                      | -0.2  | Imperceptible       | Negligible        |
| 1-78     | 25.5   | 23.7                         | 23.6                      | -0.1  | Imperceptible       | Negligible        |
| 1-79     | 22.4   | 21.2                         | 21.6                      | 0.3   | Imperceptible       | Negligible        |
| 1-80     | 23.7   | 22.2                         | 22.3                      | 0.0   | Imperceptible       | Negligible        |
| 1-81     | 30.7   | 27.9                         | 27.5                      | -0.3  | Imperceptible       | Negligible        |
| 1-82     | 37.4   | 33.8                         | 34.9                      | 1.1   | Small               | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-83     | 24.4   | 22.8                         | 22.8                      | 0.0   | Imperceptible       | Negligible        |
| 1-84     | 23.5   | 22.2                         | 22.1                      | 0.0   | Imperceptible       | Negligible        |
| 1-85     | 24.1   | 23.0                         | 23.9                      | 1.0   | Small               | Negligible        |
| 1-86     | 23.3   | 21.8                         | 21.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-87     | 23.9   | 22.7                         | 22.6                      | -0.1  | Imperceptible       | Negligible        |

5.3.7 Additional receptors identified from the DMRB congested situation assessment as moderate or substantial adverse, which were not identified as such in the main DMRB assessment, are shown in Table 14.

Table 14: Summary of DMRB annual mean NO<sub>2</sub> results for DMRB congested situation assessment not identified by main DMRB assessment (construction phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-8      | 33.4  | 90.2                         | 92.5                      | 2.3   | Medium              | Moderate adverse  |
| 1-9      | 33.5  | 38.2                         | 40.5                      | 2.3   | Medium              | Moderate adverse  |
| 1-18     | 29.3  | 53.9                         | 56.4                      | 2.5   | Medium              | Moderate adverse  |
| 1-22     | 35.2  | 52.8                         | 56.0                      | 3.3   | Medium              | Moderate adverse  |
| 1-24     | 35.6  | 88.2                         | 90.5                      | 2.2   | Medium              | Moderate adverse  |
| 1-29     | 37.1  | 80.3                         | 82.3                      | 2.0   | Medium              | Moderate adverse  |
| 1-66     | 31.4  | 56.2                         | 58.4                      | 2.2   | Medium              | Moderate adverse  |



## Detailed modelling results

5.3.8 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the EPUK methodology<sup>35</sup>. Results presented correspond to the greatest impact at each receptor from the construction traffic scenarios assessed.

Table 15: Summary of ADMS-Roads annual mean NO<sub>2</sub> results (construction phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                     |
| 1-1      | 114.8   | 98.9                         | 102.9                     | 4.1   | Large               | Substantial adverse |
| 1-3      | 77.1  | 65.0                         | 69.8                      | 4.8   | Large               | Substantial adverse |
| 1-5      | 95.0  | 79.1                         | 84.2                      | 5.1   | Large               | Substantial adverse |
| 1-8      | 95.2  | 81.2                         | 82.6                      | 1.5   | Small               | Slight adverse      |
| 1-9      | 55.4  | 47.3                         | 48.8                      | 1.5   | Small               | Slight adverse      |
| 1-10     | 61.8  | 52.1                         | 53.9                      | 1.8   | Small               | Slight adverse      |
| 1-15     | 53.1  | 44.5                         | 47.7                      | 3.2   | Medium              | Moderate adverse    |
| 1-18     | 63.9  | 53.3                         | 55.1                      | 1.8   | Small               | Slight adverse      |
| 1-21     | 66.1  | 55.2                         | 57.6                      | 2.3   | Medium              | Moderate adverse    |
| 1-22     | 71.8  | 59.1                         | 60.4                      | 1.3   | Small               | Slight adverse      |
| 1-24     | 105.7   | 91.7                         | 92.3                      | 0.6   | Small               | Slight adverse      |
| 1-25     | 113.2   | 95.1                         | 97.8                      | 2.7   | Medium              | Moderate adverse    |
| 1-29     | 88.6  | 74.9                         | 76.3                      | 1.4   | Small               | Slight adverse      |
| 1-30     | 105.9   | 89.5                         | 90.9                      | 1.4   | Small               | Slight adverse      |
| 1-33     | 102.2   | 86.7                         | 88.0                      | 1.3   | Small               | Slight adverse      |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                     |
| 1-45     | 53.9  | 45.4                         | 47.4                      | 2.1   | Medium              | Moderate adverse    |
| 1-46     | 68.3  | 57.4                         | 59.9                      | 2.5   | Medium              | Moderate adverse    |
| 1-47     | 101.2   | 88.2                         | 90.7                      | 2.4   | Medium              | Moderate adverse    |
| 1-48     | 58.2  | 48.6                         | 50.3                      | 1.7   | Small               | Slight adverse      |
| 1-49     | 117.5   | 101.1                        | 104.0                     | 2.9   | Medium              | Moderate adverse    |
| 1-62     | 64.9  | 54.0                         | 56.5                      | 2.5   | Medium              | Moderate adverse    |
| 1-66     | 65.4  | 54.3                         | 55.5                      | 1.2   | Small               | Slight adverse      |
| 1-67     | 93.3  | 79.2                         | 83.8                      | 4.6   | Large               | Substantial adverse |
| 1-69     | 107.3   | 91.9                         | 95.3                      | 3.4   | Medium              | Moderate adverse    |
| 1-79     | 52.4  | 44.1                         | 45.8                      | 1.7   | Small               | Slight adverse      |
| 1-82     | 88.7  | 74.9                         | 76.5                      | 1.6   | Small               | Slight adverse      |
| 1-85     | 69.7  | 58.9                         | 64.0                      | 5.1   | Large               | Substantial adverse |
| 1-138    | 60.9  | 50.4                         | 53.1                      | 2.7   | Medium              | Moderate adverse    |
| 1-139    | 60.8  | 50.3                         | 53.3                      | 3.1   | Medium              | Moderate adverse    |
| 1-140    | 68.9  | 57.8                         | 59.4                      | 1.6   | Small               | Slight adverse      |
| 1-141    | 65.4  | 54.3                         | 55.7                      | 1.4   | Small               | Slight adverse      |
| 1-142    | 60.5  | 50.3                         | 51.2                      | 0.9   | Small               | Slight adverse      |
| 1-143    | 62.5  | 52.4                         | 53.7                      | 1.3   | Small               | Slight adverse      |
| 1-144    | 63.7  | 53.5                         | 54.8                      | 1.4   | Small               | Slight adverse      |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                     |
| 1-145    | 64.4  | 54.3                         | 55.9                      | 1.6   | Small               | Slight adverse      |
| 1-146    | 68.2  | 57.3                         | 59.9                      | 2.6   | Medium              | Moderate adverse    |
| 1-147    | 56.2  | 47.1                         | 49.1                      | 2.0   | Small               | Slight adverse      |
| 1-148    | 57.1  | 48.0                         | 50.3                      | 2.4   | Medium              | Moderate adverse    |
| 1-149    | 63.2  | 52.7                         | 54.4                      | 1.7   | Small               | Slight adverse      |
| 1-150    | 65.4  | 54.7                         | 56.9                      | 2.2   | Medium              | Moderate adverse    |
| 1-151    | 70.9  | 59.5                         | 62.6                      | 3.1   | Medium              | Moderate adverse    |
| 1-152    | 77.4  | 65.3                         | 68.1                      | 2.8   | Medium              | Moderate adverse    |
| 1-153    | 80.8  | 68.3                         | 71.1                      | 2.9   | Medium              | Moderate adverse    |
| 1-154    | 95.0  | 80.4                         | 83.7                      | 3.3   | Medium              | Moderate adverse    |
| 1-155    | 110.7   | 92.9                         | 95.5                      | 2.6   | Medium              | Moderate adverse    |
| 1-156    | 94.1  | 80.2                         | 81.7                      | 1.4   | Small               | Slight adverse      |
| 1-157    | 84.7  | 70.7                         | 72.0                      | 1.3   | Small               | Slight adverse      |
| 1-158    | 84.3  | 70.3                         | 71.5                      | 1.2   | Small               | Slight adverse      |
| 1-159    | 101.1   | 85.8                         | 87.0                      | 1.3   | Small               | Slight adverse      |
| 1-160    | 105.0   | 89.4                         | 90.8                      | 1.4   | Small               | Slight adverse      |
| 1-161    | 67.2  | 55.3                         | 56.4                      | 1.1   | Small               | Slight adverse      |
| 1-162    | 72.3  | 59.5                         | 60.9                      | 1.4   | Small               | Slight adverse      |
| 1-163    | 92.3  | 76.9                         | 82.0                      | 5.1   | Large               | Substantial adverse |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                     |
| 1-164    | 92.5  | 77.3                         | 83.6                      | 6.3   | Large               | Substantial adverse |
| 1-165    | 90.4  | 75.8                         | 83.3                      | 7.6   | Large               | Substantial adverse |
| 1-166    | 69.4  | 58.2                         | 59.8                      | 1.5   | Small               | Slight adverse      |
| 1-167    | 70.5  | 58.9                         | 61.0                      | 2.2   | Medium              | Moderate adverse    |
| 1-168    | 70.9  | 59.3                         | 61.3                      | 2.0   | Small               | Slight adverse      |
| 1-169    | 67.1  | 56.4                         | 56.5                      | 0.1   | Imperceptible       | Negligible          |
| 1-170    | 95.1  | 80.4                         | 81.7                      | 1.3   | Small               | Slight adverse      |
| 1-171    | 90.7  | 78.9                         | 80.0                      | 1.1   | Small               | Slight adverse      |
| 1-172    | 107.3   | 93.0                         | 93.6                      | 0.6   | Small               | Slight adverse      |
| 1-173    | 120.1   | 103.3                        | 100.4                     | -2.9  | Medium              | Moderate beneficial |
| 1-174    | 119.2   | 102.5                        | 105.6                     | 3.1   | Medium              | Moderate adverse    |
| 1-175    | 105.1   | 92.0                         | 94.7                      | 2.6   | Medium              | Moderate adverse    |
| 1-176    | 102.3   | 89.3                         | 91.8                      | 2.5   | Medium              | Moderate adverse    |
| 1-177    | 114.8   | 99.0                         | 104.3                     | 5.3   | Large               | Substantial adverse |
| 1-178    | 107.3   | 92.0                         | 96.0                      | 3.9   | Medium              | Moderate adverse    |
| 1-179    | 91.9  | 78.0                         | 82.4                      | 4.4   | Large               | Substantial adverse |
| 1-180    | 112.4   | 96.8                         | 100.7                     | 3.9   | Medium              | Moderate adverse    |
| 1-181    | 106.0   | 90.8                         | 94.2                      | 3.4   | Medium              | Moderate adverse    |
| 1-182    | 106.9   | 90.6                         | 93.3                      | 2.7   | Medium              | Moderate adverse    |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|---|---------------------|---------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                     |
| 1-183    | 107.4   | 90.8                         | 92.2                      | 1.5   | Small               | Slight adverse      |
| 1-184    | 131.3   | 110.6                        | 112.9                     | 2.3   | Medium              | Moderate adverse    |
| 1-185    | 77.0  | 64.9                         | 69.8                      | 4.9   | Large               | Substantial adverse |
| 1-186    | 73.8  | 62.1                         | 66.1                      | 4.0   | Large               | Substantial adverse |
| 1-187    | 73.4  | 61.7                         | 65.2                      | 3.5   | Medium              | Moderate adverse    |
| 1-188    | 70.8  | 59.7                         | 64.1                      | 4.4   | Large               | Substantial adverse |
| 1-189    | 69.4  | 58.6                         | 63.6                      | 5.0   | Large               | Substantial adverse |
| 1-190    | 52.5  | 43.9                         | 48.4                      | 4.5   | Large               | Substantial adverse |
| 1-191    | 61.4  | 52.4                         | 55.4                      | 3.0   | Medium              | Moderate adverse    |
| 1-192    | 60.8  | 51.8                         | 53.6                      | 1.8   | Small               | Slight adverse      |
| 1-193    | 55.3  | 47.1                         | 48.5                      | 1.4   | Small               | Slight adverse      |
| 1-194    | 54.5  | 46.2                         | 47.5                      | 1.3   | Small               | Slight adverse      |
| 1-195    | 54.1  | 45.8                         | 47.9                      | 2.1   | Medium              | Moderate adverse    |
| 1-196    | 54.4  | 46.1                         | 47.8                      | 1.7   | Small               | Slight adverse      |
| 1-197    | 53.0  | 44.6                         | 45.4                      | 0.9   | Small               | Slight adverse      |
| 1-198    | 54.0  | 45.0                         | 46.6                      | 1.6   | Small               | Slight adverse      |
| 1-199    | 90.5  | 76.5                         | 77.9                      | 1.4   | Small               | Slight adverse      |
| 1-200    | 102.5   | 86.7                         | 88.7                      | 2.0   | Small               | Slight adverse      |
| 1-201    | 91.9  | 77.6                         | 79.1                      | 1.5   | Small               | Slight adverse      |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-202    | 97.8  | 82.8                         | 84.4                      | 1.6   | Small               | Slight adverse    |
| 1-203    | 119.7   | 101.2                        | 103.3                     | 2.1   | Medium              | Moderate adverse  |
| 1-204    | 103.4   | 87.5                         | 89.2                      | 1.8   | Small               | Slight adverse    |
| 1-205    | 130.4   | 109.9                        | 112.4                     | 2.6   | Medium              | Moderate adverse  |
| 1-206    | 103.6   | 87.6                         | 89.3                      | 1.7   | Small               | Slight adverse    |
| 1-207    | 52.7  | 44.3                         | 45.9                      | 1.6   | Small               | Slight adverse    |
| 1-208    | 52.5  | 44.1                         | 45.6                      | 1.5   | Small               | Slight adverse    |
| 1-209    | 53.4  | 44.9                         | 46.8                      | 1.9   | Small               | Slight adverse    |
| 1-210    | 54.4  | 45.8                         | 48.4                      | 2.6   | Medium              | Moderate adverse  |
| 1-211    | 53.6  | 45.0                         | 46.9                      | 1.9   | Small               | Slight adverse    |
| 1-212    | 52.5  | 44.5                         | 46.6                      | 2.1   | Medium              | Moderate adverse  |
| 1-213    | 52.7  | 44.7                         | 46.9                      | 2.2   | Medium              | Moderate adverse  |

Table 16: Summary of ADMS-Roads annual mean PM<sub>10</sub> results (construction phase)

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-1      | 34.0   | 31.0                         | 32.0                      | 1.0   | Small               | Negligible        |
| 1-3      | 27.1   | 24.9                         | 25.9                      | 1.0   | Small               | Negligible        |
| 1-5      | 29.8   | 27.1                         | 28.0                      | 1.0   | Small               | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-8      | 31.8   | 29.1                         | 29.2                      | 0.1   | Imperceptible       | Negligible        |
| 1-9      | 23.4   | 22.0                         | 22.3                      | 0.3   | Imperceptible       | Negligible        |
| 1-10     | 24.0   | 22.4                         | 22.5                      | 0.1   | Imperceptible       | Negligible        |
| 1-15     | 22.9   | 21.6                         | 22.1                      | 0.6   | Small               | Negligible        |
| 1-18     | 24.2   | 22.6                         | 22.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-21     | 24.6   | 23.0                         | 23.2                      | 0.1   | Imperceptible       | Negligible        |
| 1-22     | 26.5   | 24.3                         | 24.5                      | 0.2   | Imperceptible       | Negligible        |
| 1-24     | 34.3   | 31.1                         | 30.7                      | -0.4  | Small               | Negligible        |
| 1-25     | 36.0   | 32.5                         | 32.7                      | 0.2   | Imperceptible       | Negligible        |
| 1-29     | 29.1   | 26.3                         | 26.6                      | 0.3   | Imperceptible       | Negligible        |
| 1-30     | 32.3   | 28.8                         | 29.1                      | 0.3   | Imperceptible       | Negligible        |
| 1-33     | 33.9   | 30.3                         | 30.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-45     | 23.2   | 21.8                         | 22.1                      | 0.3   | Imperceptible       | Negligible        |
| 1-46     | 25.0   | 23.3                         | 23.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-47     | 32.0   | 29.1                         | 29.7                      | 0.7   | Small               | Negligible        |
| 1-48     | 23.9   | 22.3                         | 22.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-49     | 37.9   | 33.1                         | 33.3                      | 0.2   | Imperceptible       | Negligible        |
| 1-62     | 23.7   | 21.9                         | 22.2                      | 0.2   | Imperceptible       | Negligible        |
| 1-66     | 24.9   | 23.2                         | 23.3                      | 0.1   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-67     | 29.5   | 26.9                         | 28.3                      | 1.4   | Small               | Negligible        |
| 1-69     | 32.3   | 29.3                         | 30.2                      | 0.9   | Small               | Negligible        |
| 1-79     | 22.9   | 21.6                         | 21.9                      | 0.3   | Imperceptible       | Negligible        |
| 1-82     | 28.8   | 26.3                         | 26.7                      | 0.4   | Imperceptible       | Negligible        |
| 1-85     | 25.7   | 24.0                         | 25.1                      | 1.1   | Small               | Negligible        |
| 1-138    | 22.9   | 21.3                         | 21.6                      | 0.3   | Imperceptible       | Negligible        |
| 1-139    | 22.8   | 21.2                         | 21.5                      | 0.3   | Imperceptible       | Negligible        |
| 1-140    | 25.5   | 23.7                         | 23.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-141    | 24.9   | 23.1                         | 23.2                      | 0.1   | Imperceptible       | Negligible        |
| 1-142    | 24.1   | 22.5                         | 22.6                      | 0.1   | Imperceptible       | Negligible        |
| 1-143    | 23.9   | 22.3                         | 22.4                      | 0.0   | Imperceptible       | Negligible        |
| 1-144    | 24.2   | 22.6                         | 22.6                      | 0.0   | Imperceptible       | Negligible        |
| 1-145    | 24.6   | 22.9                         | 22.9                      | 0.0   | Imperceptible       | Negligible        |
| 1-146    | 25.0   | 23.3                         | 23.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-147    | 23.1   | 21.6                         | 21.7                      | 0.1   | Imperceptible       | Negligible        |
| 1-148    | 23.2   | 21.8                         | 21.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-149    | 24.1   | 22.5                         | 22.5                      | 0.1   | Imperceptible       | Negligible        |
| 1-150    | 24.5   | 22.9                         | 23.1                      | 0.1   | Imperceptible       | Negligible        |
| 1-151    | 25.5   | 23.9                         | 24.1                      | 0.2   | Imperceptible       | Negligible        |



| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-152    | 27.3   | 25.5                         | 25.7                      | 0.2   | Imperceptible       | Negligible        |
| 1-153    | 28.0   | 26.2                         | 26.4                      | 0.2   | Imperceptible       | Negligible        |
| 1-154    | 30.8   | 28.1                         | 28.4                      | 0.3   | Imperceptible       | Negligible        |
| 1-155    | 35.4   | 32.0                         | 32.2                      | 0.2   | Imperceptible       | Negligible        |
| 1-156    | 31.5   | 28.9                         | 29.0                      | 0.1   | Imperceptible       | Negligible        |
| 1-157    | 30.2   | 27.9                         | 28.0                      | 0.1   | Imperceptible       | Negligible        |
| 1-158    | 30.1   | 27.8                         | 27.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-159    | 33.6   | 30.1                         | 30.1                      | 0.1   | Imperceptible       | Negligible        |
| 1-160    | 34.7   | 30.8                         | 30.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-161    | 25.4   | 23.4                         | 23.6                      | 0.2   | Imperceptible       | Negligible        |
| 1-162    | 26.6   | 24.3                         | 24.6                      | 0.2   | Imperceptible       | Negligible        |
| 1-163    | 29.4   | 26.7                         | 27.7                      | 1.0   | Small               | Negligible        |
| 1-164    | 29.2   | 26.6                         | 27.8                      | 1.2   | Small               | Negligible        |
| 1-165    | 28.6   | 26.1                         | 27.5                      | 1.4   | Small               | Negligible        |
| 1-166    | 25.7   | 23.8                         | 24.1                      | 0.3   | Imperceptible       | Negligible        |
| 1-167    | 25.9   | 23.9                         | 24.3                      | 0.4   | Small               | Negligible        |
| 1-168    | 26.0   | 24.0                         | 24.4                      | 0.4   | Small               | Negligible        |
| 1-169    | 25.4   | 23.6                         | 23.6                      | 0.0   | Imperceptible       | Negligible        |
| 1-170    | 30.4   | 27.9                         | 28.2                      | 0.3   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-171    | 29.9   | 27.8                         | 27.9                      | 0.1   | Imperceptible       | Negligible        |
| 1-172    | 34.8   | 31.5                         | 31.0                      | -0.4  | Small               | Negligible        |
| 1-173    | 39.1   | 34.2                         | 32.7                      | -1.5  | Small               | Negligible        |
| 1-174    | 38.3   | 33.5                         | 33.7                      | 0.2   | Imperceptible       | Negligible        |
| 1-175    | 32.9   | 29.8                         | 30.6                      | 0.8   | Small               | Negligible        |
| 1-176    | 32.2   | 29.3                         | 30.0                      | 0.7   | Small               | Negligible        |
| 1-177    | 35.3   | 31.6                         | 33.0                      | 1.4   | Small               | Negligible        |
| 1-178    | 33.2   | 29.7                         | 30.8                      | 1.1   | Small               | Negligible        |
| 1-179    | 29.3   | 26.7                         | 28.0                      | 1.3   | Small               | Negligible        |
| 1-180    | 33.5   | 30.6                         | 31.6                      | 1.0   | Small               | Negligible        |
| 1-181    | 32.0   | 29.1                         | 29.9                      | 0.8   | Small               | Negligible        |
| 1-182    | 32.2   | 29.3                         | 30.0                      | 0.7   | Small               | Negligible        |
| 1-183    | 32.7   | 29.0                         | 29.4                      | 0.4   | Imperceptible       | Negligible        |
| 1-184    | 38.3   | 33.3                         | 33.8                      | 0.6   | Small               | Negligible        |
| 1-185    | 27.0   | 24.9                         | 25.9                      | 1.0   | Small               | Negligible        |
| 1-186    | 26.5   | 24.5                         | 25.2                      | 0.7   | Small               | Negligible        |
| 1-187    | 26.4   | 24.5                         | 25.2                      | 0.7   | Small               | Negligible        |
| 1-188    | 25.9   | 24.1                         | 25.1                      | 1.0   | Small               | Negligible        |
| 1-189    | 25.6   | 23.9                         | 25.0                      | 1.1   | Small               | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-190    | 22.9   | 21.5                         | 22.3                      | 0.8   | Small               | Negligible        |
| 1-191    | 24.0   | 22.7                         | 23.3                      | 0.6   | Small               | Negligible        |
| 1-192    | 23.9   | 22.6                         | 23.0                      | 0.3   | Imperceptible       | Negligible        |
| 1-193    | 23.3   | 22.0                         | 22.2                      | 0.2   | Imperceptible       | Negligible        |
| 1-194    | 23.2   | 21.9                         | 22.1                      | 0.2   | Imperceptible       | Negligible        |
| 1-195    | 23.2   | 21.8                         | 22.2                      | 0.4   | Imperceptible       | Negligible        |
| 1-196    | 23.2   | 21.9                         | 22.2                      | 0.3   | Imperceptible       | Negligible        |
| 1-197    | 23.0   | 21.6                         | 21.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-198    | 23.2   | 21.7                         | 22.0                      | 0.3   | Imperceptible       | Negligible        |
| 1-199    | 29.5   | 26.6                         | 26.9                      | 0.3   | Imperceptible       | Negligible        |
| 1-200    | 32.2   | 28.8                         | 29.2                      | 0.4   | Small               | Negligible        |
| 1-201    | 29.7   | 26.8                         | 27.1                      | 0.3   | Imperceptible       | Negligible        |
| 1-202    | 30.8   | 27.6                         | 28.0                      | 0.3   | Imperceptible       | Negligible        |
| 1-203    | 35.0   | 31.0                         | 31.4                      | 0.5   | Small               | Negligible        |
| 1-204    | 32.0   | 28.6                         | 28.9                      | 0.4   | Imperceptible       | Negligible        |
| 1-205    | 38.1   | 33.2                         | 33.8                      | 0.6   | Small               | Negligible        |
| 1-206    | 32.0   | 28.6                         | 28.9                      | 0.4   | Imperceptible       | Negligible        |
| 1-207    | 22.9   | 21.6                         | 21.9                      | 0.3   | Imperceptible       | Negligible        |
| 1-208    | 22.9   | 21.6                         | 21.8                      | 0.3   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2017 without Proposed Scheme | 2017 with Proposed Scheme |   |                     |                   |
| 1-209    | 23.0   | 21.7                         | 22.0                      | 0.4   | Imperceptible       | Negligible        |
| 1-210    | 23.2   | 21.8                         | 22.3                      | 0.5   | Small               | Negligible        |
| 1-211    | 23.1   | 21.7                         | 22.0                      | 0.4   | Imperceptible       | Negligible        |
| 1-212    | 22.9   | 21.6                         | 22.1                      | 0.4   | Small               | Negligible        |
| 1-213    | 23.0   | 21.7                         | 22.1                      | 0.4   | Small               | Negligible        |

Table 17: Summary of ADMS-Roads 24-hour mean PM<sub>10</sub> results (construction phase)

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|----------------|---------------------|---------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                     |
| 1-1      | 44.6  | 31.4                         | 35.6                      | 4.2            | Large               | Substantial adverse |
| 1-3      | 17.8  | 12.3                         | 14.7                      | 2.5            | Medium              | Negligible          |
| 1-5      | 26.9  | 17.8                         | 20.8                      | 3.0            | Medium              | Negligible          |
| 1-8      | 34.5  | 24.3                         | 24.6                      | 0.3            | Imperceptible       | Negligible          |
| 1-9      | 8.8   | 6.4                          | 6.8                       | 0.4            | Imperceptible       | Negligible          |
| 1-10     | 10.2  | 7.1                          | 7.2                       | 0.1            | Imperceptible       | Negligible          |
| 1-15     | 8.0   | 5.6                          | 6.5                       | 0.9            | Imperceptible       | Negligible          |
| 1-18     | 10.5  | 7.3                          | 7.5                       | 0.2            | Imperceptible       | Negligible          |
| 1-21     | 11.5  | 8.2                          | 8.4                       | 0.3            | Imperceptible       | Negligible          |
| 1-22     | 16.2  | 10.7                         | 11.2                      | 0.5            | Imperceptible       | Negligible          |

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                   |
| 1-24     | 46.1  | 31.9                         | 30.2                      | -1.6           | Small               | Negligible        |
| 1-25     | 54.7  | 37.4                         | 38.5                      | 1.0            | Small               | Slight adverse    |
| 1-29     | 24.4  | 15.8                         | 16.6                      | 0.8            | Imperceptible       | Negligible        |
| 1-30     | 36.9  | 23.2                         | 24.4                      | 1.2            | Small               | Negligible        |
| 1-33     | 44.2  | 28.6                         | 28.9                      | 0.3            | Imperceptible       | Negligible        |
| 1-45     | 8.4   | 5.9                          | 6.5                       | 0.6            | Imperceptible       | Negligible        |
| 1-46     | 12.5  | 8.6                          | 8.9                       | 0.3            | Imperceptible       | Negligible        |
| 1-47     | 35.5  | 24.3                         | 26.6                      | 2.3            | Medium              | Slight adverse    |
| 1-48     | 9.8   | 6.9                          | 7.0                       | 0.1            | Imperceptible       | Negligible        |
| 1-49     | 65.8  | 40.4                         | 41.2                      | 0.8            | Imperceptible       | Negligible        |
| 1-62     | 9.4   | 6.2                          | 6.6                       | 0.4            | Imperceptible       | Negligible        |
| 1-66     | 12.1  | 8.4                          | 8.6                       | 0.2            | Imperceptible       | Negligible        |
| 1-67     | 25.8  | 17.3                         | 21.6                      | 4.3            | Large               | Slight adverse    |
| 1-69     | 36.7  | 25.0                         | 28.1                      | 3.1            | Medium              | Slight adverse    |
| 1-79     | 7.9   | 5.6                          | 6.1                       | 0.5            | Imperceptible       | Negligible        |
| 1-82     | 23.5  | 15.8                         | 16.9                      | 1.1            | Small               | Negligible        |
| 1-85     | 14.1  | 10.0                         | 12.6                      | 2.6            | Medium              | Negligible        |
| 1-138    | 7.9   | 5.2                          | 5.6                       | 0.4            | Imperceptible       | Negligible        |
| 1-139    | 7.8   | 5.1                          | 5.5                       | 0.5            | Imperceptible       | Negligible        |

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                   |
| 1-140    | 13.5  | 9.5                          | 9.7                       | 0.2            | Imperceptible       | Negligible        |
| 1-141    | 12.1  | 8.3                          | 8.5                       | 0.2            | Imperceptible       | Negligible        |
| 1-142    | 10.3  | 7.2                          | 7.3                       | 0.1            | Imperceptible       | Negligible        |
| 1-143    | 10.0  | 6.9                          | 6.9                       | 0.0            | Imperceptible       | Negligible        |
| 1-144    | 10.6  | 7.4                          | 7.4                       | 0.0            | Imperceptible       | Negligible        |
| 1-145    | 11.4  | 7.9                          | 8.0                       | 0.1            | Imperceptible       | Negligible        |
| 1-146    | 12.5  | 8.6                          | 8.9                       | 0.3            | Imperceptible       | Negligible        |
| 1-147    | 8.2   | 5.7                          | 5.8                       | 0.1            | Imperceptible       | Negligible        |
| 1-148    | 8.5   | 5.9                          | 6.1                       | 0.2            | Imperceptible       | Negligible        |
| 1-149    | 10.2  | 7.1                          | 7.3                       | 0.2            | Imperceptible       | Negligible        |
| 1-150    | 11.2  | 8.0                          | 8.2                       | 0.3            | Imperceptible       | Negligible        |
| 1-151    | 13.6  | 10.0                         | 10.4                      | 0.4            | Imperceptible       | Negligible        |
| 1-152    | 18.5  | 13.7                         | 14.2                      | 0.5            | Imperceptible       | Negligible        |
| 1-153    | 20.8  | 15.4                         | 15.9                      | 0.5            | Imperceptible       | Negligible        |
| 1-154    | 30.4  | 21.0                         | 21.8                      | 0.8            | Imperceptible       | Negligible        |
| 1-155    | 51.4  | 35.3                         | 36.3                      | 0.9            | Imperceptible       | Negligible        |
| 1-156    | 33.4  | 23.5                         | 23.8                      | 0.3            | Imperceptible       | Negligible        |
| 1-157    | 28.2  | 20.3                         | 20.6                      | 0.3            | Imperceptible       | Negligible        |
| 1-158    | 27.9  | 20.1                         | 20.4                      | 0.3            | Imperceptible       | Negligible        |

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor   |
|----------|---|------------------------------|---------------------------|----------------|---------------------|---------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                     |
| 1-159    | 42.8  | 27.7                         | 28.0                      | 0.3            | Imperceptible       | Negligible          |
| 1-160    | 47.9  | 30.7                         | 31.0                      | 0.4            | Imperceptible       | Negligible          |
| 1-161    | 13.5  | 8.9                          | 9.2                       | 0.3            | Imperceptible       | Negligible          |
| 1-162    | 16.4  | 10.8                         | 11.4                      | 0.5            | Imperceptible       | Negligible          |
| 1-163    | 25.3  | 16.7                         | 19.7                      | 3.0            | Medium              | Negligible          |
| 1-164    | 24.8  | 16.5                         | 20.1                      | 3.6            | Medium              | Negligible          |
| 1-165    | 22.5  | 15.3                         | 19.2                      | 3.9            | Medium              | Negligible          |
| 1-166    | 14.1  | 9.7                          | 10.4                      | 0.7            | Imperceptible       | Negligible          |
| 1-167    | 14.5  | 9.9                          | 10.9                      | 1.0            | Imperceptible       | Negligible          |
| 1-168    | 14.9  | 10.1                         | 11.1                      | 1.0            | Imperceptible       | Negligible          |
| 1-169    | 13.3  | 9.2                          | 9.3                       | 0.1            | Imperceptible       | Negligible          |
| 1-170    | 29.0  | 20.3                         | 21.3                      | 0.9            | Imperceptible       | Negligible          |
| 1-171    | 27.0  | 20.0                         | 20.4                      | 0.5            | Imperceptible       | Negligible          |
| 1-172    | 48.3  | 33.3                         | 31.5                      | -1.8           | Small               | Negligible          |
| 1-173    | 73.2  | 45.4                         | 38.5                      | -6.9           | Large               | Substantial adverse |
| 1-174    | 68.6  | 42.1                         | 43.0                      | 0.9            | Imperceptible       | Negligible          |
| 1-175    | 39.2  | 26.8                         | 29.6                      | 2.8            | Medium              | Slight adverse      |
| 1-176    | 36.5  | 25.0                         | 27.4                      | 2.5            | Medium              | Slight adverse      |
| 1-177    | 51.3  | 34.0                         | 39.9                      | 5.9            | Large               | Substantial adverse |

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                   |
| 1-178    | 40.6  | 26.5                         | 30.6                      | 4.1            | Large               | Slight adverse    |
| 1-179    | 25.0  | 16.7                         | 20.6                      | 3.9            | Medium              | Negligible        |
| 1-180    | 42.3  | 29.7                         | 33.6                      | 3.9            | Medium              | Moderate adverse  |
| 1-181    | 35.7  | 24.3                         | 27.3                      | 3.0            | Medium              | Slight adverse    |
| 1-182    | 36.2  | 25.0                         | 27.5                      | 2.5            | Medium              | Slight adverse    |
| 1-183    | 38.4  | 24.1                         | 25.3                      | 1.2            | Small               | Negligible        |
| 1-184    | 68.3  | 41.0                         | 43.7                      | 2.7            | Medium              | Moderate adverse  |
| 1-185    | 17.7  | 12.2                         | 14.7                      | 2.5            | Medium              | Negligible        |
| 1-186    | 16.2  | 11.2                         | 12.9                      | 1.7            | Small               | Negligible        |
| 1-187    | 16.0  | 11.2                         | 12.8                      | 1.7            | Small               | Negligible        |
| 1-188    | 14.7  | 10.4                         | 12.6                      | 2.2            | Medium              | Negligible        |
| 1-189    | 13.9  | 9.9                          | 12.4                      | 2.4            | Medium              | Negligible        |
| 1-190    | 7.8   | 5.5                          | 6.8                       | 1.3            | Small               | Negligible        |
| 1-191    | 10.2  | 7.6                          | 8.7                       | 1.1            | Small               | Negligible        |
| 1-192    | 10.0  | 7.4                          | 8.0                       | 0.6            | Imperceptible       | Negligible        |
| 1-193    | 8.8   | 6.3                          | 6.7                       | 0.4            | Imperceptible       | Negligible        |
| 1-194    | 8.5   | 6.1                          | 6.5                       | 0.4            | Imperceptible       | Negligible        |
| 1-195    | 8.5   | 6.0                          | 6.6                       | 0.6            | Imperceptible       | Negligible        |
| 1-196    | 8.5   | 6.1                          | 6.6                       | 0.5            | Imperceptible       | Negligible        |



| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2017 without Proposed Scheme | 2017 with Proposed Scheme |                |                     |                   |
| 1-197    | 8.1   | 5.7                          | 5.9                       | 0.2            | Imperceptible       | Negligible        |
| 1-198    | 8.4   | 5.8                          | 6.2                       | 0.4            | Imperceptible       | Negligible        |
| 1-199    | 25.7  | 16.6                         | 17.5                      | 0.9            | Imperceptible       | Negligible        |
| 1-200    | 36.2  | 23.2                         | 24.7                      | 1.5            | Small               | Negligible        |
| 1-201    | 26.6  | 17.1                         | 18.0                      | 0.9            | Imperceptible       | Negligible        |
| 1-202    | 30.5  | 19.6                         | 20.6                      | 1.1            | Small               | Negligible        |
| 1-203    | 49.4  | 31.2                         | 33.1                      | 2.0            | Small               | Slight adverse    |
| 1-204    | 35.4  | 22.5                         | 23.8                      | 1.3            | Small               | Negligible        |
| 1-205    | 67.0  | 40.8                         | 43.8                      | 3.0            | Medium              | Moderate adverse  |
| 1-206    | 35.6  | 22.5                         | 23.8                      | 1.3            | Small               | Negligible        |
| 1-207    | 8.0   | 5.6                          | 6.1                       | 0.5            | Imperceptible       | Negligible        |
| 1-208    | 7.9   | 5.6                          | 6.0                       | 0.5            | Imperceptible       | Negligible        |
| 1-209    | 8.2   | 5.8                          | 6.4                       | 0.6            | Imperceptible       | Negligible        |
| 1-210    | 8.5   | 6.0                          | 6.8                       | 0.8            | Imperceptible       | Negligible        |
| 1-211    | 8.2   | 5.8                          | 6.4                       | 0.6            | Imperceptible       | Negligible        |
| 1-212    | 8.0   | 5.7                          | 6.4                       | 0.7            | Imperceptible       | Negligible        |
| 1-213    | 8.0   | 5.8                          | 6.5                       | 0.7            | Imperceptible       | Negligible        |

## Assessment of significance

- 5.3.9 The significance of the impacts on air quality from construction traffic associated with the Proposed Scheme has been assessed in accordance with the EPUK methodology<sup>35</sup>. AQMAs cover the entire study area and pollution levels exceed air quality standards in many locations, particularly along major roads.
- 5.3.10 The DMRB assessment identified a number of receptors where there may be moderate or substantial air quality impacts from traffic during the construction phase. In some cases these are beneficial and lead to a decrease in air pollution at those receptors but in others these are adverse impacts.
- 5.3.11 The moderate or substantial beneficial impacts identified are at properties located at:
- Guilford Street, close to Russell Square;
  - Melton Street, between Drummond Street and Euston Street;
  - the corner of Southampton Row and Vernon Place;
  - the junction of Woburn Place and Bernard Street;
  - the junction of Gordon Square and Byng Place; and
  - the junction of Southampton Row and Bloomsbury Place.
- 5.3.12 The ADMS-Roads assessment predicted that there will be numerous locations where air quality standards are exceeded, with and without the Proposed Scheme, where concentrations of NO<sub>2</sub> and PM<sub>10</sub> increase with the Proposed Scheme.
- 5.3.13 NO<sub>2</sub> impacts during the construction phase are predicted to be substantial adverse at receptors on:
- A4200 Eversholt Street (numerous receptors);
  - Ampthill Square;
  - A501 Euston Road, close to the junction with Eversholt Street;
  - Euston Square;
  - A400 Hampstead Road, south of William Road (multiple receptors).
- 5.3.14 NO<sub>2</sub> impacts during the construction phase are predicted to be moderate adverse at receptors on:
- A501 Euston Road, between Gordon Street and Grays Inn Road (multiple receptors);
  - A501 Gray's Inn Road, north of Swinton Street (multiple receptors);
  - Upper Woburn Place;
  - North Gower Street (two receptors);
  - Ampthill Square;

- Aldenham Street;
- Polygon Road;
- Monica Shaw Court, Purchase Street;
- Arlington Road (two receptors);
- A5 Edgware Road, between Marylebone Flyover and St. John's Wood Road (multiple receptors);
- St. John's Wood Road;
- A41 Wellington Road (two receptors); and
- Albany Street.

5.3.15 PM<sub>10</sub> impacts (in relation to the 24-hour standard) during the construction phase are predicted to be substantial adverse at two receptors on the A501 Euston Road, between Gordon Street and Upper Woburn Place, and moderate adverse at receptors along the Euston Road, between Euston Station and Chalton Street, and on the A501 Gray's Inn Road, between Kings Cross Bridge and Birkenhead Street.

5.3.16 The NO<sub>2</sub> and PM<sub>10</sub> impacts will give rise to significant effects.

5.3.17 In certain circumstances a qualitative assessment has been undertaken. This was the case in respect of the proposed lorry-holding area at London Zoo Coach Park, for roads that will be subject to additional local HGV movements associated with the lorry-holding area. The qualitative assessment concluded that the additional HGV movements would not lead to any changes in the magnitude of air quality impacts on receptors along these roads that would be considered to constitute significant effects.

## 5.4 Operational traffic model

5.4.1 Operational traffic data used in this assessment are detailed in Volume 5: Appendix TR-001-000. The scenario assessed is based on maximum traffic on affected roads during the opening year of the Proposed Scheme.

### Receptors assessed

5.4.2 For all road links where DMRB criteria for local air quality were met, a number of receptors representative of worst-case exposure locations were selected for assessment. These included locations representative of highest concentrations along the roads, including closest to junctions or to the road itself. Receptors assessed are presented in Map AQ-01-001 (Volume 5, Air Quality Map Book).

Table 18: Modelled receptors (operational phase)

| Receptor | Description/location   | Ordnance Survey coordinates |
|----------|--|-----------------------------|
| 1-88     | Property at junction of Euston Street and Regnart Buildings      | 529429, 182531              |
| 1-89     | Property at junction of Euston Road and Midland Road             | 530075, 182819              |
| 1-90     | Royal Mail depot, junction of Eversholt Street and Barnby Street | 529452, 183003              |

| Receptor | Description/location   | Ordnance Survey coordinates |
|----------|--|-----------------------------|
| 1-91     | Property at junction of Delancey Street and Arlington Road   | 528944, 183621              |
| 1-92     | Property at junction of Phoenix Road and Chalton Street  | 529681, 182971              |
| 1-93     | Property at junction of Stanhope Street and Varndell Street  | 529076, 182815              |
| 1-94     | Property at junction of Delancey Street and Camden High Street                                       | 529010, 183660              |
| 1-95     | Madame Tussauds, Marylebone Road   | 528091, 182037              |
| 1-96     | Property at junction of Pratt Street and Bayham Street   | 529093, 183700              |
| 1-97     | Property at junction of Gordon Square and Byng Place   | 529776, 182146              |
| 1-98     | Property at junction of Mornington Crescent and Arlington Road                                       | 529095, 183357              |
| 1-99     | Property at junction of Euston Road and Judd Street  | 530078, 182782              |
| 1-100    | Property at junction of Mornington Crescent and Hampstead Road                                       | 529157, 183376              |
| 1-101    | Property at south-west corner of Gordon Square   | 529745, 182191              |
| 1-102    | Property at junction of Russell Square and Guilford  | 530198, 182025              |
| 1-103    | Property at junction of Euston Road and Tottenham Court Road, near Warren Street Underground Station | 529255, 182286              |
| 1-104    | Property at junction of Hampstead Road and North Gower Street  | 529230, 182668              |
| 1-105    | Property at junction of Swinton Street and Gray's Inn Road   | 530551, 182771              |
| 1-106    | Property at junction of Russell Square and Woburn Place  | 530105, 182103              |
| 1-107    | Property at junction of Euston Road and Birkenhead Street  | 530316, 182952              |
| 1-108    | Property at junction of Marylebone Road and Marylebone High Street                                   | 528354, 182072              |
| 1-109    | Property at junction of Starcross Street and Cobourg Street  | 529358, 182643              |
| 1-110    | Property at junction of Hampstead Road and Harrington Square   | 529186, 183134              |
| 1-111    | Property at junction of Tottenham Court Road and Torrington Place                                    | 529482, 181945              |
| 1-112    | Property at junction of Gower Street and Torrington Place  | 529637, 182048              |
| 1-113    | Property at junction of King's Cross Bridge and Gray's Inn Road                                      | 530429, 182965              |
| 1-114    | Property at junction of King's Cross Bridge and Pentonville Road                                     | 530443, 182993              |
| 1-115    | Property at junction of Mornington Street and Arlington Road   | 529020, 183459              |
| 1-116    | Property at junction of Sidmouth Street and Gray's Inn Road  | 530605, 182601              |
| 1-117    | 16, Upper Woburn Place   | 529768, 182562              |
| 1-118    | Property at the junction of Aldwych and Kingsway   | 530703, 181062              |
| 1-119    | University College Hospital building, junction of Euston Road and Gower Street                       | 529402, 182364              |
| 1-120    | Melia White House, junction of Osnaburgh Terrace and Albany Street                                   | 528849, 182299              |
| 1-121    | Unison Centre 130, Euston Road   | 529845, 182662              |
| 1-122    | Property at the junction of Tavistock Square and Woburn Place  | 529968, 182289              |

| Receptor | Description/location   | Ordnance Survey coordinates |
|----------|--|-----------------------------|
| 1-123    | Property at the junction of Hampstead Road and Drummond Street               | 529231, 182478              |
| 1-124    | Property at the junction of Great Portland Street and Osnauburgh Street      | 528856, 182125              |
| 1-125    | Property at the junction of Crowndale Road and Royal College Street          | 529549, 183504              |
| 1-126    | Property at the junction of North Gower Street and Starcross Street          | 529287, 182576              |
| 1-127    | Holy Trinity Church, Marylebone Road   | 528881, 182217              |
| 1-128    | Property at the junction of Granby Terrace and Stanhope Street               | 529045, 183045              |
| 1-129    | Property at the junction of Vernon Place and Southampton Row                 | 530451, 181657              |
| 1-130    | Property at the junction of North Gower Street and Euston Road               | 529402, 182411              |
| 1-131    | Property at the junction of Euston Road and Melton Street                    | 529543, 182493              |
| 1-132    | Property at the junction of Camden Street and Crowndale Road                 | 529407, 183471              |
| 1-133    | Property at the junction of Grafton Place and Eversholt Street               | 529734, 182650              |
| 1-134    | Property at the junction of Harrington Square and Lilington Place            | 529258, 183193              |
| 1-135    | Property at the junction of Victoria Embankment and Savoy Street             | 530668, 180681              |
| 1-136    | Property on the southern corner of junction of Euston Road and Gordon Street | 529568, 182456              |
| 1-137    | Property at the junction of Gower Street and Montague Place                  | 529870, 181756              |
| 1-214    | Somerton House , Duke's Road   | 529860, 182631              |
| 1-215    | 95, Euston Road  | 529977, 182713              |
| 1-216    | 165, Euston Road   | 529744, 182562              |
| 1-217    | Endsleigh Court , Upper Woburn Place   | 529824, 182484              |
| 1-218    | Tavistock House South , Tavistock Square                                     | 529887, 182437              |
| 1-219    | Near St. James' House, 108 Hampstead Road                                    | 529230, 182668              |
| 1-220    | Maria Fidelis Convent Lower School, North Gower Street                       | 529734, 182650              |
| 1-221    | 237, North Gower Street  | 529227, 182703              |
| 1-222    | 119, Hampstead Road  | 529237, 182645              |

## Background concentrations

The background concentrations used in the assessment are shown in Table 19 and

### 5.4.3 Table 20, taken from the Defra maps<sup>26</sup>.

Table 19: Background 2012 concentrations at assessed receptors

| Receptor (or zone of receptors)                                    | Concentrations (µg/m <sup>3</sup> ) |                 |                  |
|--|-------------------------------------|-----------------|------------------|
|  | NOx                                 | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-88) Property at junction of Euston Street and Regnart Buildings | 102.3                               | 51.0            | 23.9             |
| (1-89) Property at junction of Euston Road and Midland             | 94.7                                | 48.6            | 23.3             |

| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| Road   |   |                 |                  |
| (1-90) Royal Mail depot, junction of Eversholt Street and Barnby Street                                      | 76.7  | 40.7            | 22.2             |
| (1-91) Property at junction of Delancey Street and Arlington Road  | 67.5  | 37.1            | 21.0             |
| (1-92) Property at junction of Phoenix Road and Chalton Street   | 102.3                                       | 51.0            | 23.9             |
| (1-93) Property at junction of Stanhope Street and Varndell Street   | 102.3                                       | 51.0            | 23.9             |
| (1-94) Property at junction of Delancey Street and Camden High Street  | 76.7  | 40.7            | 22.2             |
| (1-95) Madame Tussauds, Marylebone Road  | 82.1  | 43.0            | 22.5             |
| (1-96) Property at junction of Pratt Street and Bayham Street  | 76.7  | 40.7            | 22.2             |
| (1-97) Property at junction of Gordon Square and Byng Place  | 102.3                                       | 51.0            | 23.9             |
| (1-98) Property at junction of Mornington Crescent and Arlington Road  | 76.7  | 40.7            | 22.2             |
| (1-99) Property at junction of Euston Road and Judd Street   | 94.7  | 48.6            | 23.3             |
| (1-100) Property at junction of Mornington Crescent and Hampstead Road                                       | 76.7  | 40.7            | 22.2             |
| (1-101) Property at south-west corner of Gordon Square   | 102.3                                       | 51.0            | 23.9             |
| (1-102) Property at junction of Russell Square and Guilford  | 94.7  | 48.6            | 23.3             |
| (1-103) Property at junction of Euston Road and Tottenham Court Road, near Warren Street Underground Station | 102.3                                       | 51.0            | 23.9             |
| (1-104) Property at junction of Hampstead Road and North Gower Street  | 102.3                                       | 51.0            | 23.9             |
| (1-105) Property at junction of Swinton Street and Gray's Inn Road   | 94.7  | 48.6            | 23.3             |
| (1-106) Property at junction of Russell Square and Woburn Place  | 94.7  | 48.6            | 23.3             |
| (1-107) Property at junction of Euston Road and Birkenhead Street  | 94.7  | 48.6            | 23.3             |
| (1-108) Property at junction of Marylebone Road and Marylebone High Street                                   | 82.1  | 43.0            | 22.5             |
| (1-109) Property at junction of Starcross Street and Cobourg Street  | 102.3                                       | 51.0            | 23.9             |
| (1-110) Property at junction of Hampstead Road and Harrington Square   | 76.7  | 40.7            | 22.2             |
| (1-111) Property at junction of Tottenham Court Road and   | 117.4                                       | 55.8            | 24.3             |

| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| Torrington Place   |   |                 |                  |
| (1-112) Property at junction of Gower Street and Torrington Place                      | 102.3                                       | 51.0            | 23.9             |
| (1-113) Property at junction of King's Cross Bridge and Gray's Inn Road                | 94.7  | 48.6            | 23.3             |
| (1-114) Property at junction of King's Cross Bridge and Pentonville Road               | 94.7  | 48.6            | 23.3             |
| (1-115) Property at junction of Mornington Street and Arlington Road                   | 76.7  | 40.7            | 22.2             |
| (1-116) Property at junction of Sidmouth Street and Gray's Inn Road                    | 94.7  | 48.6            | 23.3             |
| (1-117) 16, Upper Woburn Place   | 102.3                                       | 51.0            | 23.9             |
| (1-118) Property at the junction of Aldwych and Kingsway                               | 116.4                                       | 56.4            | 24.1             |
| (1-119) University College Hospital building, junction of Euston Road and Gower Street | 102.3                                       | 51.0            | 23.9             |
| (1-120) Melia White House, junction of Osnaburgh Terrace and Albany Street             | 82.1  | 43.0            | 22.5             |
| (1-121) Unison Centre 130, Euston Road   | 102.3                                       | 51.0            | 23.9             |
| (1-122) Property at the junction of Tavistock Square and Woburn Place                  | 102.3                                       | 51.0            | 23.9             |
| (1-123) Property at the junction of Hampstead Road and Drummond Street                 | 102.3                                       | 51.0            | 23.9             |
| (1-124) Property at the junction of Great Portland Street and Osnaburgh Street         | 82.1  | 43.0            | 22.5             |
| (1-125) Property at the junction of Crowndale Road and Royal College Street            | 76.7  | 40.7            | 22.2             |
| (1-126) Property at the junction of North Gower Street and Starcross Street            | 102.3                                       | 51.0            | 23.9             |
| (1-127) Holy Trinity Church, Marylebone Road   | 82.1  | 43.0            | 22.5             |
| (1-128) Property at the junction of Granby Terrace and Stanhope Street                 | 76.7  | 40.7            | 22.2             |
| (1-129) Property at the junction of Vernon Place and Southampton Row                   | 116.4                                       | 56.4            | 24.1             |
| (1-130) Property at the junction of North Gower Street and Euston Road                 | 102.3                                       | 51.0            | 23.9             |
| (1-131) Property at the junction of Euston Road and Melton Street                      | 102.3                                       | 51.0            | 23.9             |
| (1-132) Property at the junction of Camden Street and Crowndale Road                   | 76.7  | 40.7            | 22.2             |
| (1-133) Property at the junction of Grafton Place and                                  | 102.3                                       | 51.0            | 23.9             |

| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| Eversholt Street   |   |                 |                  |
| (1-134) Property at the junction of Harrington Square and Lilington Place            | 76.7  | 40.7            | 22.2             |
| (1-135) Property at the junction of Victoria Embankment and Savoy Street             | 123.3                                       | 59.0            | 24.0             |
| (1-136) Property on the southern corner of junction of Euston Road and Gordon Street | 102.3                                       | 51.0            | 23.9             |
| (1-137) Property at the junction of Gower Street and Montague Place                  | 117.4                                       | 55.8            | 24.3             |
| (1-214) Somerton House , Duke's Road   | 102.3                                       | 51.0            | 23.9             |
| (1-215) 95, Euston Road  | 102.3                                       | 51.0            | 23.9             |
| (1-216) 165, Euston Road   | 102.3                                       | 51.0            | 23.9             |
| (1-217) Endsleigh Court , Upper Woburn Place   | 102.3                                       | 51.0            | 23.9             |
| (1-218) Tavistock House South , Tavistock Square                                     | 102.3                                       | 51.0            | 23.9             |
| (1-219) Near St. James' House, 108 Hampstead Road                                    | 102.3                                       | 51.0            | 23.9             |
| (1-220) Maria Fidelis Convent Lower School, North Gower Street                       | 102.3                                       | 51.0            | 23.9             |
| (1-221) 237, North Gower Street  | 102.3                                       | 51.0            | 23.9             |
| (1-222) 119, Hampstead Road  | 102.3                                       | 51.0            | 23.9             |

Table 20: Background 2026 concentrations at assessed receptors

| Receptor (or zone of receptors)   | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|---|---|-----------------|------------------|
|   | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-88) Property at junction of Euston Street and Regnart Buildings      | 55.6  | 31.5            | 21.2             |
| (1-89) Property at junction of Euston Road and Midland Road             | 53.0  | 30.8            | 20.8             |
| (1-90) Royal Mail depot, junction of Eversholt Street and Barnby Street | 43.9  | 26.3            | 20.0             |
| (1-91) Property at junction of Delancey Street and Arlington Road       | 39.4  | 24.2            | 18.8             |
| (1-92) Property at junction of Phoenix Road and Chalton Street          | 55.6  | 31.5            | 21.2             |
| (1-93) Property at junction of Stanhope Street and Varndell Street      | 55.6  | 31.5            | 21.2             |
| (1-94) Property at junction of Delancey Street and Camden High Street   | 43.9  | 26.3            | 20.0             |
| (1-95) Madame Tussauds, Marylebone Road                                 | 45.4  | 27.0            | 20.1             |



| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-96) Property at junction of Pratt Street and Bayham Street  | 43.9  | 26.3            | 20.0             |
| (1-97) Property at junction of Gordon Square and Byng Place  | 55.6  | 31.5            | 21.2             |
| (1-98) Property at junction of Mornington Crescent and Arlington Road  | 43.9  | 26.3            | 20.0             |
| (1-99) Property at junction of Euston Road and Judd Street   | 53.0  | 30.8            | 20.8             |
| (1-100) Property at junction of Mornington Crescent and Hampstead Road                                       | 43.9  | 26.3            | 20.0             |
| (1-101) Property at south-west corner of Gordon Square   | 55.6  | 31.5            | 21.2             |
| (1-102) Property at junction of Russell Square and Guilford  | 53.0  | 30.8            | 20.8             |
| (1-103) Property at junction of Euston Road and Tottenham Court Road, near Warren Street Underground Station | 55.6  | 31.5            | 21.2             |
| (1-104) Property at junction of Hampstead Road and North Gower Street  | 55.6  | 31.5            | 21.2             |
| (1-105) Property at junction of Swinton Street and Gray's Inn Road   | 53.0  | 30.8            | 20.8             |
| (1-106) Property at junction of Russell Square and Woburn Place  | 53.0  | 30.8            | 20.8             |
| (1-107) Property at junction of Euston Road and Birkenhead Street  | 53.0  | 30.8            | 20.8             |
| (1-108) Property at junction of Marylebone Road and Marylebone High Street                                   | 45.4  | 27.0            | 20.1             |
| (1-109) Property at junction of Starcross Street and Cobourg Street  | 55.6  | 31.5            | 21.2             |
| (1-110) Property at junction of Hampstead Road and Harrington Square   | 43.9  | 26.3            | 20.0             |
| (1-111) Property at junction of Tottenham Court Road and Torrington Place                                    | 70.0  | 37.1            | 21.5             |
| (1-112) Property at junction of Gower Street and Torrington Place  | 55.6  | 31.5            | 21.2             |
| (1-113) Property at junction of King's Cross Bridge and Gray's Inn Road                                      | 53.0  | 30.8            | 20.8             |
| (1-114) Property at junction of King's Cross Bridge and Pentonville Road                                     | 53.0  | 30.8            | 20.8             |
| (1-115) Property at junction of Mornington Street and Arlington Road   | 43.9  | 26.3            | 20.0             |
| (1-116) Property at junction of Sidmouth Street and Gray's Inn Road  | 53.0  | 30.8            | 20.8             |
| (1-117) 16, Upper Woburn Place   | 55.6  | 31.5            | 21.2             |

| Receptor (or zone of receptors)  | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NOx   | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-118) Property at the junction of Aldwych and Kingsway                               | 65.5  | 35.9            | 21.3             |
| (1-119) University College Hospital building, junction of Euston Road and Gower Street | 55.6  | 31.5            | 21.2             |
| (1-120) Melia White House, junction of Osnaburgh Terrace and Albany Street             | 45.4  | 27.0            | 20.1             |
| (1-121) Unison Centre 130, Euston Road   | 55.6  | 31.5            | 21.2             |
| (1-122) Property at the junction of Tavistock Square and Woburn Place                  | 55.6  | 31.5            | 21.2             |
| (1-123) Property at the junction of Hampstead Road and Drummond Street                 | 55.6  | 31.5            | 21.2             |
| (1-124) Property at the junction of Great Portland Street and Osnaburgh Street         | 45.4  | 27.0            | 20.1             |
| (1-125) Property at the junction of Crowndale Road and Royal College Street            | 43.9  | 26.3            | 20.0             |
| (1-126) Property at the junction of North Gower Street and Starcross Street            | 55.6  | 31.5            | 21.2             |
| (1-127) Holy Trinity Church, Marylebone Road   | 45.4  | 27.0            | 20.1             |
| (1-128) Property at the junction of Granby Terrace and Stanhope Street                 | 43.9  | 26.3            | 20.0             |
| (1-129) Property at the junction of Vernon Place and Southampton Row                   | 65.5  | 35.9            | 21.3             |
| (1-130) Property at the junction of North Gower Street and Euston Road                 | 55.6  | 31.5            | 21.2             |
| (1-131) Property at the junction of Euston Road and Melton Street                      | 55.6  | 31.5            | 21.2             |
| (1-132) Property at the junction of Camden Street and Crowndale Road                   | 43.9  | 26.3            | 20.0             |
| (1-133) Property at the junction of Grafton Place and Eversholt Street                 | 55.6  | 31.5            | 21.2             |
| (1-134) Property at the junction of Harrington Square and Lilington Place              | 43.9  | 26.3            | 20.0             |
| (1-135) Property at the junction of Victoria Embankment and Savoy Street               | 66.9  | 36.5            | 21.1             |
| (1-136) Property on the southern corner of junction of Euston Road and Gordon Street   | 55.6  | 31.5            | 21.2             |
| (1-137) Property at the junction of Gower Street and Montague Place                    | 70.0  | 37.1            | 21.5             |
| (1-214) Somerton House, Duke's Road  | 55.6  | 31.5            | 21.2             |
| (1-215) 95, Euston Road  | 55.6  | 31.5            | 21.2             |
| (1-216) 165, Euston Road   | 55.6  | 31.5            | 21.2             |

| Receptor (or zone of receptors)                                | Concentrations ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |
|--|---|-----------------|------------------|
|  | NO <sub>x</sub>                             | NO <sub>2</sub> | PM <sub>10</sub> |
| (1-217) Endsleigh Court , Upper Woburn Place                   | 55.6  | 31.5            | 21.2             |
| (1-218) Tavistock House South , Tavistock Square               | 55.6  | 31.5            | 21.2             |
| (1-219) Near St. James' House, 108 Hampstead Road              | 55.6  | 31.5            | 21.2             |
| (1-220) Maria Fidelis Convent Lower School, North Gower Street | 55.6  | 31.5            | 21.2             |
| (1-221) 237, North Gower Street                                | 55.6  | 31.5            | 21.2             |
| (1-222) 119, Hampstead Road                                    | 55.6  | 31.5            | 21.2             |

## Design Manual for Roads and Bridges model results

5.4.4 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the EPUK methodology<sup>37</sup>.

Table 21: Summary of DMRB annual mean NO<sub>2</sub> results (operational phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-88     | 50.5  | 31.1                         | 34.5                      | 3.4   | Medium              | Slight adverse    |
| 1-89     | 110.4   | 56.2                         | 57.4                      | 1.2   | Small               | Slight adverse    |
| 1-90     | 43.8  | 27.2                         | 29.7                      | 2.5   | Medium              | Negligible        |
| 1-91     | 42.8  | 25.9                         | 26.7                      | 0.8   | Small               | Negligible        |
| 1-92     | 40.8  | 27.9                         | 28.0                      | 0.0   | Imperceptible       | Negligible        |
| 1-93     | 50.5  | 31.2                         | 31.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-94     | 66.9  | 36.6                         | 36.5                      | -0.1  | Imperceptible       | Negligible        |
| 1-95     | 99.4  | 48.3                         | 48.0                      | -0.2  | Imperceptible       | Negligible        |
| 1-96     | 56.9  | 31.4                         | 31.7                      | 0.3   | Imperceptible       | Negligible        |
| 1-97     | 62.5  | 36.4                         | 35.0                      | -1.4  | Small               | Negligible        |
| 1-98     | 42.5  | 27.2                         | 28.1                      | 0.9   | Small               | Negligible        |
| 1-99     | 93.2  | 48.4                         | 50.3                      | 1.8   | Small               | Slight adverse    |
| 1-100    | 50.9  | 30.6                         | 30.3                      | -0.3  | Imperceptible       | Negligible        |
| 1-101    | 58.9  | 35.0                         | 33.5                      | -1.4  | Small               | Negligible        |
| 1-102    | 72.6  | 49.2                         | 49.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-103    | 66.7  | 41.4                         | 42.0                      | 0.5   | Small               | Slight adverse    |
| 1-104    | 87.5  | 47.0                         | 49.2                      | 2.2   | Medium              | Moderate adverse  |
| 1-105    | 95.9  | 50.8                         | 51.6                      | 0.9   | Small               | Slight adverse    |
| 1-106    | 86.4  | 50.7                         | 51.0                      | 0.2   | Imperceptible       | Negligible        |
| 1-107    | 122.4   | 59.6                         | 60.9                      | 1.2   | Small               | Slight adverse    |
| 1-108    | 87.8  | 44.0                         | 43.8                      | -0.2  | Imperceptible       | Negligible        |
| 1-109    | 49.6  | 30.7                         | 33.5                      | 2.8   | Medium              | Slight adverse    |
| 1-110    | 52.2  | 30.3                         | 29.7                      | -0.6  | Small               | Negligible        |
| 1-111    | 68.6  | 41.8                         | 42.8                      | 1.0   | Small               | Slight adverse    |

<sup>37</sup> Environmental Protection UK (EPUK), (2010), *Development Control: Planning for Air Quality*

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor      |
|----------|---|------------------------------|---------------------------|---|---------------------|------------------------|
|          | 2012 baseline                                       | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                        |
| 1-112    | 65.2  | 37.2                         | 37.8                      | 0.6   | Small               | Slight adverse         |
| 1-113    | 96.6  | 51.2                         | 52.4                      | 1.2   | Small               | Slight adverse         |
| 1-114    | 92.7  | 50.2                         | 51.7                      | 1.5   | Small               | Slight adverse         |
| 1-115    | 42.2  | 26.8                         | 28.0                      | 1.2   | Small               | Negligible             |
| 1-116    | 55.5  | 33.0                         | 33.2                      | 0.2   | Imperceptible       | Negligible             |
| 1-117    | 84.0  | 51.5                         | 53.7                      | 2.3   | Medium              | Moderate adverse       |
| 1-118    | 115.3   | 64.6                         | 65.1                      | 0.6   | Small               | Slight adverse         |
| 1-119    | 62.3  | 36.8                         | 37.6                      | 0.9   | Small               | Slight adverse         |
| 1-120    | 51.4  | 29.8                         | 30.5                      | 0.8   | Small               | Negligible             |
| 1-121    | 94.5  | 50.1                         | 49.8                      | -0.3  | Imperceptible       | Negligible             |
| 1-122    | 80.3  | 51.1                         | 50.6                      | -0.5  | Small               | Slight beneficial      |
| 1-123    | 67.7  | 37.4                         | 38.8                      | 1.4   | Small               | Slight adverse         |
| 1-124    | 54.4  | 29.9                         | 29.6                      | -0.4  | Imperceptible       | Negligible             |
| 1-125    | 65.2  | 36.5                         | 36.5                      | 0.1   | Imperceptible       | Negligible             |
| 1-126    | 49.9  | 30.8                         | 30.8                      | 0.0   | Imperceptible       | Negligible             |
| 1-127    | 105.0   | 51.0                         | 50.8                      | -0.2  | Imperceptible       | Negligible             |
| 1-128    | 41.2  | 26.7                         | 26.8                      | 0.1   | Imperceptible       | Negligible             |
| 1-129    | 109.5   | 61.5                         | 61.7                      | 0.2   | Imperceptible       | Negligible             |
| 1-130    | 50.2  | 31.4                         | 32.0                      | 0.6   | Small               | Negligible             |
| 1-131    | 95.1  | 51.0                         | 46.6                      | -4.4  | Large               | Substantial beneficial |
| 1-132    | 44.8  | 28.0                         | 28.0                      | 0.1   | Imperceptible       | Negligible             |
| 1-133    | 66.9  | 37.5                         | 39.5                      | 2.0   | Small               | Slight adverse         |
| 1-134    | 46.9  | 28.1                         | 27.6                      | -0.5  | Small               | Negligible             |
| 1-135    | 96.4  | 56.0                         | 56.2                      | 0.2   | Imperceptible       | Negligible             |
| 1-136    | 94.5  | 49.9                         | 46.5                      | -3.4  | Medium              | Moderate beneficial    |
| 1-137    | 75.6  | 44.3                         | 44.3                      | 0.0   | Imperceptible       | Negligible             |

Table 22: Summary of DMRB annual mean PM<sub>10</sub> results (operational phase)

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-88     | 21.3   | 21.3                         | 22.2                      | 0.9   | Small               | Negligible        |
| 1-89     | 31.8   | 26.9                         | 27.2                      | 0.3   | Imperceptible       | Negligible        |
| 1-90     | 20.8   | 20.7                         | 21.1                      | 0.4   | Small               | Negligible        |
| 1-91     | 20.2   | 19.9                         | 20.1                      | 0.2   | Imperceptible       | Negligible        |
| 1-92     | 21.2   | 21.2                         | 21.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-93     | 21.3   | 21.3                         | 21.3                      | 0.0   | Imperceptible       | Negligible        |
| 1-94     | 23.7   | 22.5                         | 22.5                      | 0.0   | Imperceptible       | Negligible        |
| 1-95     | 32.4   | 28.7                         | 28.6                      | -0.1  | Imperceptible       | Negligible        |
| 1-96     | 22.5   | 21.8                         | 21.8                      | 0.0   | Imperceptible       | Negligible        |
| 1-97     | 23.5   | 22.6                         | 22.3                      | -0.4  | Imperceptible       | Negligible        |
| 1-98     | 20.4   | 20.4                         | 20.6                      | 0.2   | Imperceptible       | Negligible        |
| 1-99     | 29.1   | 25.9                         | 26.3                      | 0.4   | Small               | Negligible        |
| 1-100    | 21.8   | 21.6                         | 21.5                      | -0.1  | Imperceptible       | Negligible        |
| 1-101    | 22.8   | 22.2                         | 21.9                      | -0.4  | Imperceptible       | Negligible        |
| 1-102    | 24.2   | 24.0                         | 23.9                      | -0.1  | Imperceptible       | Negligible        |
| 1-103    | 23.7   | 23.3                         | 23.5                      | 0.2   | Imperceptible       | Negligible        |
| 1-104    | 27.1   | 24.7                         | 25.5                      | 0.8   | Small               | Negligible        |
| 1-105    | 30.0   | 25.7                         | 25.9                      | 0.2   | Imperceptible       | Negligible        |
| 1-106    | 26.7   | 24.4                         | 24.2                      | -0.1  | Imperceptible       | Negligible        |
| 1-107    | 34.4   | 27.4                         | 27.7                      | 0.3   | Imperceptible       | Negligible        |
| 1-108    | 28.2   | 25.3                         | 25.3                      | 0.0   | Imperceptible       | Negligible        |
| 1-109    | 21.2   | 21.2                         | 22.0                      | 0.8   | Small               | Negligible        |
| 1-110    | 22.2   | 21.7                         | 21.4                      | -0.3  | Imperceptible       | Negligible        |
| 1-111    | 24.3   | 23.2                         | 23.5                      | 0.2   | Imperceptible       | Negligible        |
| 1-112    | 25.1   | 22.7                         | 22.9                      | 0.2   | Imperceptible       | Negligible        |
| 1-113    | 29.8   | 25.3                         | 25.5                      | 0.3   | Imperceptible       | Negligible        |
| 1-114    | 27.0   | 24.9                         | 25.0                      | 0.2   | Imperceptible       | Negligible        |
| 1-115    | 20.4   | 20.3                         | 20.6                      | 0.3   | Imperceptible       | Negligible        |

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-116    | 22.4   | 21.7                         | 21.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-117    | 28.6   | 25.3                         | 25.8                      | 0.5   | Small               | Negligible        |
| 1-118    | 29.2   | 26.4                         | 26.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-119    | 23.5   | 22.6                         | 22.9                      | 0.3   | Imperceptible       | Negligible        |
| 1-120    | 22.5   | 21.8                         | 22.0                      | 0.2   | Imperceptible       | Negligible        |
| 1-121    | 28.8   | 26.0                         | 26.4                      | 0.4   | Small               | Negligible        |
| 1-122    | 26.7   | 25.2                         | 24.9                      | -0.3  | Imperceptible       | Negligible        |
| 1-123    | 24.7   | 23.3                         | 23.8                      | 0.5   | Small               | Negligible        |
| 1-124    | 22.6   | 21.6                         | 21.5                      | -0.1  | Imperceptible       | Negligible        |
| 1-125    | 23.5   | 22.7                         | 22.8                      | 0.1   | Imperceptible       | Negligible        |
| 1-126    | 21.2   | 21.2                         | 21.2                      | 0.0   | Imperceptible       | Negligible        |
| 1-127    | 33.0   | 26.3                         | 26.4                      | 0.1   | Imperceptible       | Negligible        |
| 1-128    | 20.2   | 20.2                         | 20.3                      | 0.0   | Imperceptible       | Negligible        |
| 1-129    | 31.2   | 26.0                         | 26.0                      | -0.1  | Imperceptible       | Negligible        |
| 1-130    | 21.9   | 21.9                         | 22.1                      | 0.3   | Imperceptible       | Negligible        |
| 1-131    | 32.9   | 27.1                         | 25.7                      | -1.4  | Small               | Negligible        |
| 1-132    | 20.9   | 20.8                         | 20.8                      | 0.0   | Imperceptible       | Negligible        |
| 1-133    | 24.0   | 22.5                         | 22.9                      | 0.4   | Imperceptible       | Negligible        |
| 1-134    | 21.4   | 21.1                         | 20.9                      | -0.2  | Imperceptible       | Negligible        |
| 1-135    | 28.7   | 27.0                         | 27.0                      | 0.0   | Imperceptible       | Negligible        |
| 1-136    | 33.0   | 26.7                         | 25.7                      | -1.0  | Small               | Negligible        |
| 1-137    | 26.1   | 23.1                         | 23.1                      | 0.0   | Imperceptible       | Negligible        |

5.4.5 Two additional receptors identified from the DMRB congested situation assessment as moderate or substantial adverse, which were not identified as such in the main DMRB assessment, are shown in Table 23.

Table 23: Summary of DMRB annual mean NO<sub>2</sub> results for congested situation assessment not identified by DMRB assessment (operational phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-121    | 94.5  | 56.3                         | 58.8                      | 2.5   | Medium              | Moderate adverse  |

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-133    | 66.9  | 39.1                         | 41.3                      | 2.1   | Medium              | Moderate adverse  |

## Detailed modelling results

5.4.6 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the EPUK methodology<sup>35</sup>. Results presented correspond to the greatest impact at each receptor from the construction traffic scenarios assessed.

Table 24: Summary of ADMS-Roads annual mean NO<sub>2</sub> results (operational phase)

| Receptor | NO <sub>2</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline                                       | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-104    | 75.4  | 53.2                         | 53.1                      | -0.1  | Imperceptible       | Negligible        |
| 1_117    | 112.0   | 61.6                         | 64.4                      | 2.9   | Medium              | Moderate adverse  |
| 1_121    | 104.2   | 54.3                         | 55.2                      | 0.9   | Small               | Slight adverse    |
| 1-133    | 99.9  | 51.2                         | 53.4                      | 2.3   | Medium              | Moderate adverse  |
| 1_214    | 109.1   | 57.6                         | 58.0                      | 0.4   | Small               | Slight adverse    |
| 1_215    | 105.7   | 55.8                         | 55.8                      | 0.0   | Imperceptible       | Negligible        |
| 1_216    | 112.8   | 59.9                         | 63.8                      | 3.9   | Medium              | Moderate adverse  |
| 1_217    | 87.5  | 50.2                         | 51.3                      | 1.1   | Small               | Slight adverse    |
| 1_218    | 94.4  | 54.9                         | 56.3                      | 1.4   | Small               | Slight adverse    |
| 1-219    | 73.2  | 49.7                         | 49.0                      | -0.7  | Small               | Slight beneficial |
| 1-220    | 71.6  | 49.2                         | 49.1                      | 0.0   | Imperceptible       | Negligible        |
| 1-221    | 78.0  | 56.0                         | 56.0                      | 0.0   | Imperceptible       | Negligible        |
| 1-222    | 71.2  | 48.8                         | 48.7                      | 0.0   | Imperceptible       | Negligible        |

Table 25: Summary of ADMS-Roads annual mean PM<sub>10</sub> results (operational phase)

| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1-104    | 27.9   | 25.0                         | 25.0                      | 0.0   | Imperceptible       | Negligible        |



| Receptor | PM <sub>10</sub> concentrations (µg/m <sup>3</sup> ) |                              |                           | Change in concentrations (µg/m <sup>3</sup> ) | Magnitude of change | Impact descriptor |
|----------|--|------------------------------|---------------------------|---|---------------------|-------------------|
|          | 2012 baseline  | 2026 without Proposed Scheme | 2026 with Proposed Scheme |   |                     |                   |
| 1_117    | 34.6   | 27.2                         | 27.8                      | 0.7   | Small               | Negligible        |
| 1_121    | 31.6   | 25.7                         | 26.1                      | 0.5   | Small               | Negligible        |
| 1-133    | 30.0   | 24.4                         | 24.8                      | 0.5   | Small               | Negligible        |
| 1_214    | 33.1   | 26.8                         | 27.3                      | 0.5   | Small               | Negligible        |
| 1_215    | 32.7   | 26.7                         | 27.0                      | 0.3   | Imperceptible       | Negligible        |
| 1_216    | 34.9   | 27.3                         | 28.0                      | 0.8   | Small               | Negligible        |
| 1_217    | 28.3   | 24.2                         | 24.3                      | 0.2   | Imperceptible       | Negligible        |
| 1_218    | 29.2   | 25.1                         | 25.3                      | 0.2   | Imperceptible       | Negligible        |
| 1-219    | 27.4   | 24.2                         | 24.1                      | -0.1  | Imperceptible       | Negligible        |
| 1-220    | 26.9   | 24.1                         | 24.1                      | 0.0   | Imperceptible       | Negligible        |
| 1-221    | 28.5   | 25.6                         | 25.6                      | 0.0   | Imperceptible       | Negligible        |
| 1-222    | 26.9   | 24.0                         | 24.0                      | 0.0   | Imperceptible       | Negligible        |

Table 26: Summary of ADMS-Roads 24-hour mean PM<sub>10</sub> results (operational phase)

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2026 without Proposed Scheme | 2026 with Proposed Scheme |                |                     |                   |
| 1-104    | 20.5  | 12.4                         | 12.4                      | 0.0            | Imperceptible       | Negligible        |
| 1_117    | 47.3  | 18.1                         | 20.1                      | 2.0            | Small               | Negligible        |
| 1_121    | 34.0  | 14.1                         | 15.2                      | 1.2            | Small               | Negligible        |
| 1-133    | 27.5  | 10.9                         | 12.0                      | 1.1            | Small               | Negligible        |
| 1_214    | 40.3  | 17.1                         | 18.4                      | 1.4            | Small               | Negligible        |
| 1_215    | 38.3  | 16.7                         | 17.6                      | 1.0            | Imperceptible       | Negligible        |
| 1_216    | 49.0  | 18.5                         | 20.8                      | 2.3            | Medium              | Negligible        |
| 1_217    | 21.7  | 10.5                         | 10.9                      | 0.3            | Imperceptible       | Negligible        |
| 1_218    | 24.6  | 12.6                         | 13.1                      | 0.5            | Imperceptible       | Negligible        |
| 1-219    | 18.8  | 10.5                         | 10.3                      | -0.1           | Imperceptible       | Negligible        |
| 1-220    | 17.4  | 10.3                         | 10.3                      | 0.0            | Imperceptible       | Negligible        |

| Receptor | Number days exceeding PM <sub>10</sub> 24-hour standard |                              |                           | Change in days | Magnitude of change | Impact descriptor |
|----------|---|------------------------------|---------------------------|----------------|---------------------|-------------------|
|          | 2012 baseline   | 2026 without Proposed Scheme | 2026 with Proposed Scheme |                |                     |                   |
| 1-221    | 22.3  | 14.0                         | 14.0                      | 0.0            | Imperceptible       | Negligible        |
| 1-222    | 17.3  | 10.1                         | 10.1                      | 0.0            | Imperceptible       | Negligible        |

### Assessment of significance

- 5.4.7 The significance of the impacts on air quality from operational traffic associated with the Proposed Scheme has been assessed in accordance with the EPUK methodology<sup>35</sup>. AQMAs cover the entire study area and pollution levels exceed air quality standards in many locations particularly along major roads.
- 5.4.8 The DMRB assessment identified two receptors on Euston Road, close to Upper Woburn Place, where there may be moderate adverse NO<sub>2</sub> impacts from traffic during the operational phase, one location on Euston Road, close to Gordon Street, where there may be a substantial beneficial NO<sub>2</sub> impact and a further location on Euston Road, close to Gordon Street, where there may be a moderate beneficial impact. The ADMS-Roads assessment also predicted that there will be moderate adverse impacts from traffic during the operational phase at receptors close to the junction with Euston Road and Upper Woburn Place, and that there will be a moderate adverse impact at a receptor further north, at the junction of the A4200 Eversholt Street and Grafton Place.
- 5.4.9 PM<sub>10</sub> impacts are predicted to be negligible at receptors in the study area during the operational phase.
- 5.4.10 The NO<sub>2</sub> impacts will give rise to significant effects. These are both beneficial and adverse and are limited in spatial extent, that is, confined to roadside locations.

## 6 Air quality assessment - combustion plant

### 6.1 Overall assessment approach

- 6.1.1 The air quality assessment for the Euston station combustion plant emissions has used two different approaches based on the scale of changes in emissions. The combustion plant was screened according to the requirements of the Clean Air Act 1993<sup>38</sup> Assessment Methodology<sup>39</sup>. Further analysis on stack height was carried out using the D1 method<sup>40</sup>.
- 6.1.2 Stationary combustion plant must comply with the provisions of the Clean Air Act (1993). This legislation applies to plant burning more than 45.4kg/h of solid fuel or thermal input of liquid or gaseous fuel of more than 366.4 kW (or combined plant sharing flues). Boilers of a smaller size are not covered under the provisions of the Clean Air Act (1993) and so any requirements of this legislation do not apply.
- 6.1.3 The D1 methodology is used to determine "the heights of discharge stacks for polluting emissions, which should be adequate in normal circumstances.... to render an emission harmless"<sup>40</sup>.

### 6.2 Clean Air Act Requirements

- 6.2.1 There are two combustion plants currently in operation at Euston Station. These are:
- the main boiler room with two diesel oil-fired boilers, which is used to heat the main station building, concourse and offices, and all associated hot water; and
  - the Hardwick House boiler room with three diesel oil fired boilers, which is used to heat the space and water in Hardwick House (an office building).
- 6.2.2 Following changes to Euston Station as part of the Proposed Scheme, new gas-fired boilers will be installed to replace the existing plant.
- 6.2.3 The existing and proposed combustion plant at Euston Station are summarised in Table 27.

Table 27: Summary of stationary sources at Euston Station

| Stationary source                  | Fuel type  | Annual fuel consumption <sup>41</sup> | Equivalent annual average thermal input (kW) |
|------------------------------------|------------|---------------------------------------|--|
| Euston Station - main boiler house | Diesel oil | 193,466 litres                        | 239  |
| Euston Station - Hardwick House    | Diesel oil | 68,770 litres                         | 85   |

<sup>38</sup> Clean Air Act 1993 (c. 11) London, Her Majesty's Stationery Office.

<sup>39</sup> ARUP/URS for HS2, (2013), *HS2 Topic: Air quality; Technical Note– Guidance on Assessment Methodology*.

<sup>40</sup> Her Majesty's Inspectorate of Pollution, (1993), *Technical Guidance Note (Dispersion) D1 Guidelines on Discharge Heights for Polluting Emissions, HMSO*.

<sup>41</sup> Annual average fuel use for the existing combustion plants is based on fuel deliveries during the financial year April 2011 to March 2012.

|                                |             |              |     |
|--------------------------------|-------------|--------------|-----|
| Future Euston combustion plant | Natural gas | 5,000,000kWh | 571 |
|--------------------------------|-------------|--------------|-----|

- 6.2.4 Based on the Air Quality Technical Note– Guidance on Assessment Methodology, the existing combustion plant in the Main Boiler Room and Hardwick House are too small to be covered under the provisions of the Clean Air Act (1993) and their impacts on air quality are negligible.
- 6.2.5 The proposed future combustion plant at Euston station comprises up to four natural gas-fired boilers (including a standby boiler). It is large enough to be considered under the provisions of the Clean Air Act (1993).
- 6.2.6 A further assessment, using the D1 methodology, has been undertaken for the proposed future combustion plant. For comparison purposes, the existing combustion plant has also been assessed in this way.
- 6.2.7 There is also some minor gas use by the catering facilities, including six air handling units (serving Ryedale House and two washing and food preparation facilities). Based on the Air Quality Technical Note– Guidance on Assessment Methodology, these are too small to be covered under the provisions of the Clean Air Act (1993) and their impacts on air quality are negligible and so have not been considered further in this assessment.

### 6.3 Model inputs for D1 assessment

- 6.3.1 The D1 methodology is based on instantaneous emissions and was designed to consider short-term peak concentrations, rather than the annual average considered by the Clean Air Act screening assessment. Space and water heating boilers are not operated continuously at the same settings throughout the year. There are seasonal and daily variations in their use. These hours and the estimated peak hourly fuel use are set out in Table 28.

Table 28: Operational hours and estimated hourly fuel use of existing Euston Station Combustion Plant

|  | Hours of operation         | Hourly fuel use (litres/h) - main boiler house | Hourly fuel use (litres/h) - Hardwick House |
|--|----------------------------|--|---|
| Annual average fuel use (for comparison) | -                          | 22.1   | 7.9   |
| Winter office hours (October - March)    | 8am-6pm                    | 58.2   | 31.4  |
| Winter non-office station hours          | 6am-8am and 6pm - midnight | 29.1   | -   |
| Summer station hours (hot water only)    | 6am-midnight               | 13.6   | 6.3   |

- 6.3.2 The characteristics of the boilers in the main boiler room have been provided by the boiler manufacturer for this fuel type and firing rate. Only limited data were available for the boilers in Hardwick House and so professional estimates and emission factors<sup>42</sup> have been used to calculate the combustion data. The future scenario uses input data as described in the Air Quality Technical Note– Guidance on Assessment Methodology.
- 6.3.3 The firing rate for the main boiler room during winter office hours is 25% of the capacity of one boiler. This is the minimum firing rate that can be achieved with these boilers. For lower firing rates, the boilers are assumed to be operated on an on-off cycle, which allows the boiler to provide lower levels of heat and hot water as needed.
- 6.3.4 The D1 assessment has been carried out using the worst case instantaneous emissions for the existing combustion plants during winter office hours.
- 6.3.5 The emission characteristics for the proposed future combustion plant are based on those set out in Air Quality Technical Note – Guidance on Assessment Methodology as the detailed design of the combustion plant is not complete. These data are based on a pessimistic combustion plant design. The actual combustion plant will comply with all relevant guidance and emission standards and is likely to have lower impacts than this worst case assessment.
- 6.3.6 This assessment takes into account the buildings under and around the stack, in accordance with the D1 methodology. This includes the existing station building, Hardwick House and the proposed future buildings.
- 6.3.7 The D1 methodology requires background concentrations of each pollutant (the 98th percentile of the 1 hour mean concentration). Current background concentrations are taken from Bloomsbury monitoring site as the local site most representative of Euston station. For the future scenario, the background concentration is calculated by multiplying the annual average background concentration predicted by Defra for this location in 2026 by a factor of 2.5, as set out in the D1 methodology.
- 6.3.8 The inputs used in the D1 assessment are set out in Table 29.

Table 29: D1 assessment inputs

| D1 inputs                                | Euston Station -<br>main boiler house                            | Euston Station -<br>Hardwick House | Future Euston<br>combustion plant |
|--|--|------------------------------------|-----------------------------------|
| Total flow (actual<br>m <sup>3</sup> /s) | 0.31   | 0.22                               | 0.26                              |
| Discharge<br>temperature (°C)            | 157  | 140                                | 71                                |
| NO <sub>2</sub> emission rate            | 125mg/Nm <sup>3</sup><br>(equivalent to 0.032 g/s) <sup>43</sup> | 0.014g/s                           | 0.013g/s                          |

<sup>42</sup> Defra; National Atmospheric Emission Inventory database; <http://naei.defra.gov.uk/>; Accessed: July 2013.

<sup>43</sup> Based on stack conditions of 6.5 % moisture content and 14 % oxygen content, where reference conditions are 16 % oxygen content and dry. These are estimated figures, but sensitivity analysis has shown that, in this instance, these do not affect the conclusions of the assessment.

|  |  |          |   |
|--|--|----------|---|
| PM emission rate   | Less than 40mg/Nm <sup>3</sup><br>(equivalent to less than 0.010g/s)   | 0.019g/s | negligible  |
| Height of any buildings within five times the uncorrected discharge height (m) | 7.9  | 11.9     | 12.0  |
| Background concentration   | 0.101mg/m <sup>3</sup> NO <sub>2</sub><br>0.057mg/m <sup>3</sup> PM <sub>10</sub><br>(Bloomsbury AURN data for 2012) |          | 0.079mg/m <sup>3</sup> NO <sub>2</sub><br>(LAQM background maps for 2026) <sup>26</sup> |
| Guidance concentration of pollutant at stack conditions                        | 0.2mg/m <sup>3</sup> NO <sub>2</sub><br>0.15mg/m <sup>3</sup> PM   |          |   |

6.3.9 In addition to the buildings under and around the stack for the proposed combustion plant, the high speed part of Euston Station could also be affected by the plume from the stack. The D1 methodology states that "Buildings taller than the discharge stack but at a distance beyond 5m may cause plume meandering. As a rough guide, any building taller than the discharge stack within a distance of five building heights may have this effect.... There may also be problems due to the plume running into the taller building. Particular attention should be given to the possibility of contaminating nearby ventilation inlets."

6.3.10 The detailed design of the combustion plant and the HS2 building roof will take these potential factors into consideration to ensure that these do not affect local air quality and the Euston Station building ventilation.

## 6.4 Model outputs for D1 assessment

6.4.1 The results from the D1 assessment are shown in Table 30. As can be seen in all cases the actual stack height (or proposed stack height for the future combustion plant) is greater than the stack height recommended by the D1 assessment.

Table 30: A comparison of actual and D1 recommended stack heights for the Euston combustion plants

| Stationary source                  | Actual stack height (m) | D1 recommended stack height(for NO <sub>2</sub> ) (m) | D1 recommended stack height (for PM) (m) |
|------------------------------------|-------------------------|---|--|
| Euston Station - main boiler house | 18                      | 10  | 9  |
| Euston Station -Hardwick House     | 15                      | 13  | 14                                       |
| Future Euston combustion plant     | 15                      | 13  | -  |

6.4.2 The D1 methodology also sets out a number of other considerations, as follows:

- the minimum discharge velocity for a stationary source of this magnitude is

10m/s to avoid emissions flowing down the outside of the stack in high wind speeds;

- no discharge stack should be less than 3m above the ground or any adjacent areas to which there is general access. For example, roof areas and elevated walkways; and
- a discharge stack should be at least 3m above any opening windows or ventilation air inlets.

6.4.3 The proposed combustion plant at Euston station meets all these criteria. It should be noted, however, that good design principles will still apply to the siting of the stacks in order to minimise the possibility of the dispersion being unduly influenced by nearby structures and the emitted pollutants affecting nearby buildings with operable windows and ventilation inlets.

6.4.4 The stack for the future combustion plant is proposed to be located on the Service Deck roof, more than nine metres from the adjoining taller buildings. An alternative location on the roof of the Parcel Deck (which is adjacent to the Service Deck, with a roof level 1.5m higher) more than 9m from the adjoining taller buildings, may be considered during the detailed design stage for either the main combustion stack or a secondary boiler room.. The D1 assessment for combustion plant in this location also requires a stack discharge height of 3m above the roof. . If a secondary plant room is required, this stack will located at least 9m from the main combustion plant stack and the design and location of both stacks will take into account the risk of plume downwash (where the dispersion of a plume may be disrupted by a taller stack).

## 6.5 Other criteria

6.5.1 The Mayor of London's draft Supplementary Planning Guidance on Sustainable Design and Construction<sup>44</sup> sets emission limits for combustion plants in new development proposals. This Guidance is currently only in draft form and these emission standards have not been formally adopted as Mayoral policy yet.

6.5.2 The draft guidance states, "where individual and/or communal gas boilers are installed in commercial and domestic buildings they should achieve a NO<sub>x</sub> rating of less than 40mgNO<sub>x</sub>/kWh."

6.5.3 The proposed combustion plant for Euston station is still under design and worst case characteristics have been assumed for this assessment, including a NO<sub>x</sub> rating of 80mgNO<sub>x</sub>/kWh. The actual combustion plant will comply with all relevant emission standards, including those set out in the draft Mayoral guidance, if this guidance is adopted.

## 6.6 Assessment of significance

6.6.1 The assessment of the impacts on air quality from the Euston station combustion plants has concluded the following:

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<sup>44</sup> Mayor of London, (2013), *Draft Supplementary Planning Guidance: Sustainable Design and Construction (Published for public consultation)*.

- based on the Air Quality Technical Note– Guidance on Assessment Methodology, the emissions from the existing combustion plant (the Main Boiler Room and Hardwick House) are too small to be covered under the provisions of the Clean Air Act (1993) and their impacts on air quality are negligible.
- the proposed future combustion plant at Euston station is still small (less than twice as large as the current plant and using cleaner fuel), but large enough to be considered under the provisions of the Clean Air Act (1993). It will result in fewer NO<sub>x</sub> emissions from the Euston site than is currently the case.
- the actual and proposed stack heights are greater than the minimum stack heights recommended by the D1 methodology, which is designed to determine the stack height required to render an emission harmless.

6.6.2 The annual average background concentration in 2026 (when the future combustion plant will be in operation) is 32µg/m<sup>3</sup>, within the NO<sub>2</sub> annual average standard of 40µg/m<sup>3</sup>.



## 7 References

City of Westminster, (2013), *Air Quality Action Plan 2013-2018*.

City of Westminster, (2011), *Air Quality Progress Report*.

City of Westminster, (2010), *Air Quality Progress Report*.

City of Westminster, (2011), *Core Strategy Policy, CS30*.

City of Westminster, (2010), *Unitary Development Plan*.

Department for Environment, Food and Rural Affairs (Defra), (2012), *Defra background maps 2010*; <http://laqm.defra.gov.uk/maps/maps2010.html> ; Accessed: July 2013.

Department of Food Environment and Rural Affairs, (2007), *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*.

Environment Agency, *What's in your Backyard?*; <http://www.environment-agency.gov.uk/wiyby> ; Accessed: August 2013.

Greater London Authority (GLA), (2010), *Clearing the Air: The Mayor's Air Quality Strategy*, GLA, London.

Greater London Authority (GLA), (2010), *Draft Climate Change Adaptation Strategy for London*, GLA, London

Greater London Authority (GLA), (2010), *London Atmospheric Emissions Inventory 2008 Concentration Maps*; <http://data.london.gov.uk/laei-2008-concentration-maps> ; Accessed: May 2013.

Greater London Authority (GLA), (2006), *Sustainable Design and Construction: The London Plan Supplementary Planning Guidance*, GLA, London.

Greater London Authority (GLA), (2011), *The London Plan: Spatial Development Strategy for Greater London*, GLA, London.

Highways Agency, (2007), *The Design Manual for Roads and Bridges* (Volume 11, Section 3, Part 1 Air Quality HA207/07).

Institute of Air Quality Management (IAQM), (2011), *Guidance on the assessment of the impacts of construction on air quality and the determination of their significance*.

Kings College London; [www.londonair.org.uk](http://www.londonair.org.uk) ; Accessed: May 2013.

London Borough of Camden, (2013), *Air Quality Action Plan 2013-2015* (draft for consultation)

London Borough of Camden, (2012), *Air Quality Updating and Screening Assessment*.

London Borough of Camden, (2010), *Core Strategy Policy, CS16*.

*Pollution Prevention and Control Act 1999* (c.24), London, Her Majesty's Stationery Office.

*The Environmental Permitting (England and Wales) Regulations 2010* (SI 210 No. 675), London, Her Majesty's Stationery Office.